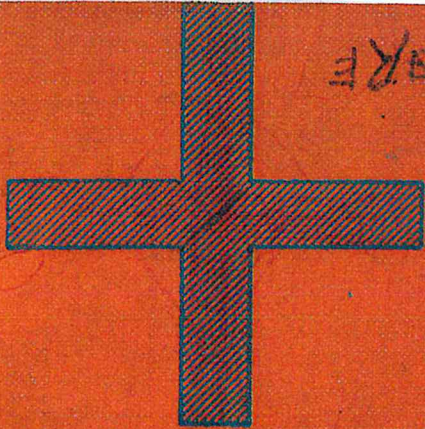
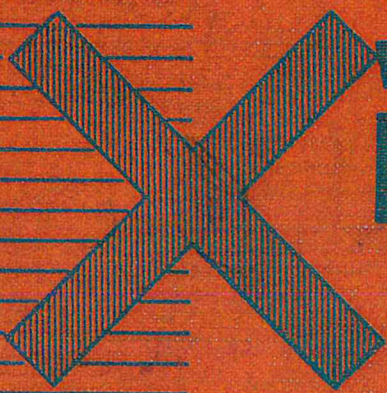


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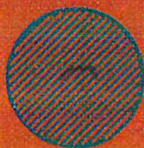
ARITHMETIC

with
MEANING



GRADE

6



McCARTHY

Arithmetic *with* Meaning

GRADE

6

by

J. P. McCarthy, M.A., Ed.D.

Principal, Nova Scotia Normal College

*Authorized for use in the schools of Nova Scotia
and Prince Edward Island; approved for permissive
use in the schools of Ontario*

**THOMAS NELSON & SONS (CANADA) LIMITED
TORONTO**

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SAVING TIME DOING ARITHMETIC

You can save a lot of time and get more practice in addition and subtraction if you do not copy the exercises from the text into your note-books or scribblers.

Hold a sheet of paper under the first row of exercises and write the answers on it. When you have finished the first row of exercises, fold these answers under. Now hold the folded edge under the second row of exercises and write the answers. Fold these answers under and write the answers for the third row. Do the same for each other row. Be sure to write the number of each row before you write the answers.

The folded paper below will show you how to save time in addition and subtraction.

1.	52	74	63	85	148	764
	24	15	42	37	95	657
1./	76	89	105	122	243	1421

2.	65	86	72	91	127	425
	-23	-31	-19	-54	-62	-168
2./	42	55	53	37	65	257

IT PAYS TO SAVE TIME



MEETING FRIENDS AT THE BAND CONCERT

It was just a few days before school was to open. Joe was going to start Grade VI. He had not seen many of his school chums during the summer vacation. There was to be a band concert in the park that afternoon and Joe decided to go. At the band concert he met several of his school friends and they talked about the things they did during the holidays. Let's follow Joe and his friends around.

1. "What did you do this summer, Harry?" asked Joe. "I sold newspapers", said Harry. "I did this for 6 weeks and I sold 240 newspapers each week". How many newspapers did Harry sell altogether?

2. "And what did you do during the holidays?" Joe asked Ellen. "I was at a girls' camp for 3 weeks", said Ellen. "It was wonderful and cost only \$24.60". How much a week did the camp cost Ellen?

3. Bill said that he and his family went on a long automobile trip. Bill said, "When we left home the speedometer read 1876 miles and when we got back it read 3325 miles. How many miles did Bill travel on his trip?

4. "I did a lot of baby-sitting this summer", said Jean. "Why, only last week I worked at it for 7 hours and I earned 35¢ an hour". How much did Jean earn?

5. Leo said he went to the Boy Scouts' camp. He said there were 84 boys at the camp and that there were 6 boys to a tent. How many tents were there?

6. Joe bought 6 hot-dogs, one for each of them. If the hot-dogs cost 10¢ each, how much change did Joe get from a \$1 bill?

Joe was pleased to meet his friends again. Now they are all ready to get a good start at their Grade VI work.

THE MEANING OF NUMBERS

Does 3 always mean 3? This sounds like a very foolish question but it is not. 3 does not always mean 3. Let us see why.

Our number system is called the *decimal* system. Decimal means *ten*. So our number system is the "*ten's system*".

Each figure in a number has a place name and a place value. Each place value is 10 times the place value to its right.

Does 3 always mean 3? Look at the number 3333 below for place names and place values.

thousands	hundreds	tens	ones
3	3	3	3

In a whole number place names are read from the right to the left.

The 3 on the right means 3 <i>ones</i> or	3
The second 3 means 3 <i>tens</i> or	30
The third 3 means 3 <i>hundreds</i> or	300
The fourth 3 means 3 <i>thousands</i> or	3000
So the number is—————→	<u>3333</u>

The number 3333 is read, "three thousand, three hundred thirty-three".

The number 5082 is read, "five thousand, eighty-two". Do not use "and" in reading whole numbers.

1. Tell what each figure in these numbers means: 74, 253, 608, 1498, 4276, 9035, 7508

2. Read these numbers: 461, 702, 560, 2697, 1285, 3074, 8609

THE MEANING OF VERY LARGE NUMBERS

In 1956 the population of Canada was about 16,080,791. What does 16,080,791 mean?

Each figure in the number 16,080,791 has a place value and a place name. Each place value is 10 times the place value on its right. Below you see the names of the places. Start at the right and tell what each figure in the number means.

ten-millions	millions	hundred-thousands	ten-thousands	thousands	hundreds	tens	ones
1	6,	0	8	0,	7	9	1

Meaning of 16,080,791

10,000,000
6,000,000
000,000
80,000
0,000
700
90
1
16,080,791

Large numbers are more easily read if they are marked off by commas in periods of three from the right as shown above. Each period has a name. The names of the periods are shown below.

Millions'	Thousands'	Ones'
Period	Period	Period
16	080	791

16,080,791 is read: "Sixteen million, eighty thousand, seven hundred ninety-one".

1. Tell what each figure in each of these numbers means: 26,517; 60,381; 374,295; 806,902; 4,869,273; 9,180,624; 17,238,356; 25,197,863

2. Read these numbers: 11,495; 40,308; 271,698; 518,706; 1,459,268; 3,500,000; 69,204,317; 167,250,000

LEARNING ABOUT THINGS BY READING NUMBERS

Each statement below was taken from a newspaper, a magazine, or a book. To read intelligently you must often be able to read and to understand the meaning of numbers. Read each statement.

1. There were 1,580 people at the political meeting.
2. The St. Lawrence River is 1,900 miles long.
3. The distance through the moon is 2,160 miles.
4. The distance through the earth at the equator is 7,926 miles.
5. The greatest known depth of the Atlantic Ocean is 31,600 feet.
6. Last Tuesday, 46,319 copies of the "Daily News" were sold.
7. The number of pupils who attend the public schools in Nova Scotia is about 146,000.
8. The highest known mountain peak in North America, Mount McKinlay, in Alaska, is 20,300 feet high.
9. The sun gives 400,000 times as much light as the moon.
10. The distance through the sun is 864,100 miles.
11. The total area of Canada is about 3,700,000 square miles.
12. A bridge built across a large river cost \$7,750,000.
13. A street car company in a large city carried 25,473,259 passengers last year.
14. Bring to class statements you find in newspapers in which large numbers are used.

USING ROUND NUMBERS IN EVERYDAY LIFE

Large numbers are easier to remember if the numbers are rounded off.

If the cost of building a new rink was \$95,347, most people would say that the rink cost about \$95,000 because \$95,000 is easier to remember than the exact number \$95,347.

In this case, \$95,347 is rounded off to the *nearest thousand* because it is nearer \$95,000 than it is to \$96,000. If the rink cost \$95,825, it would be rounded off to \$96,000.

Again, if the population of a city was 1,213,647, it would be easier to remember, and just as useful, if we thought of the population of the city as 1,200,000. In this case, the exact number 1,213,647 is rounded off to the *nearest hundred thousand*. It is nearer 1,200,000 than it is to 1,300,000.

Read these statements and round off the numbers to the nearest hundred.

1. There were 2,579 people at the baseball game.
2. The population of our city is 8,198.

Read these statements and round off the numbers to the nearest thousand.

3. The distance around the earth is 24,902 miles.
4. The sum of \$57,260 was collected in the Red Cross drive.

Read these statements and round off the numbers to the nearest hundred thousand.

5. In a recent year one Canadian province spent \$8,675,450 on its roads.
6. An insurance company sold \$25,218,000 of insurance last year.

THE MEANING OF ADDITION

When we put things together we *add*. The numbers added are called *addends*.

The sign for addition is $+$ and means *and* or *plus*.

The answer in addition is called the *sum*.

ADDING COLUMNS

Add. Add down and check by adding up.

1.	3	5	2	9	6	4	8	9
	4	6	8	7	8	7	5	8
	7	3	3	6	7	9	4	7
	5	8	9	4	4	3	3	9
	6	5	7	9	8	8	5	5
	4	6	6	5	9	4	2	7
	<u>4</u>	<u>6</u>	<u>6</u>	<u>5</u>	<u>9</u>	<u>4</u>	<u>2</u>	<u>7</u>
2.	2	6	9	8	2	9	6	7
	5	6	5	9	9	6	7	8
	6	7	4	5	7	6	1	8
	2	4	7	6	9	3	6	6
	9	5	9	9	5	8	7	7
	3	4	5	4	7	5	4	9
	5	8	6	9	3	8	5	6
	<u>5</u>	<u>8</u>	<u>6</u>	<u>9</u>	<u>3</u>	<u>8</u>	<u>5</u>	<u>6</u>
3.	6	7	9	3	6	4	9	5
	2	5	4	8	9	8	9	8
	7	6	5	6	7	4	6	3
	4	3	8	9	3	9	7	8
	3	8	5	4	7	6	8	6
	8	4	3	7	9	9	4	5
	4	7	9	5	6	7	5	9
	3	5	7	4	8	5	8	6
	<u>3</u>	<u>5</u>	<u>7</u>	<u>4</u>	<u>8</u>	<u>5</u>	<u>8</u>	<u>6</u>

4. $8+4+5+6+4+8$

5. $7+9+5+9+3+8$

6. $6+5+4+5+9+8+7$

7. $8+8+7+3+6+4+7+9$

THINGS TO REMEMBER WHEN ADDING

Here are some things to remember when adding. They will help you to get correct answers.

1. Make good clear figures.
2. Put the numbers to be added directly under each other in straight columns; the ones under the ones, the tens under the tens, etc.
3. Start at the top and add down.
4. Do not count when adding.
5. Do not add by grouping 10's.
6. When adding, skip the zeros and the blank spaces.
7. Add the carry number to the top figure in the next column immediately.
8. When adding dollars and cents put the decimal points directly under each other, and put the decimal point in the sum directly under the decimal points above.
9. Check the addition by adding up.

PRACTICE IN ADDITION

Add.

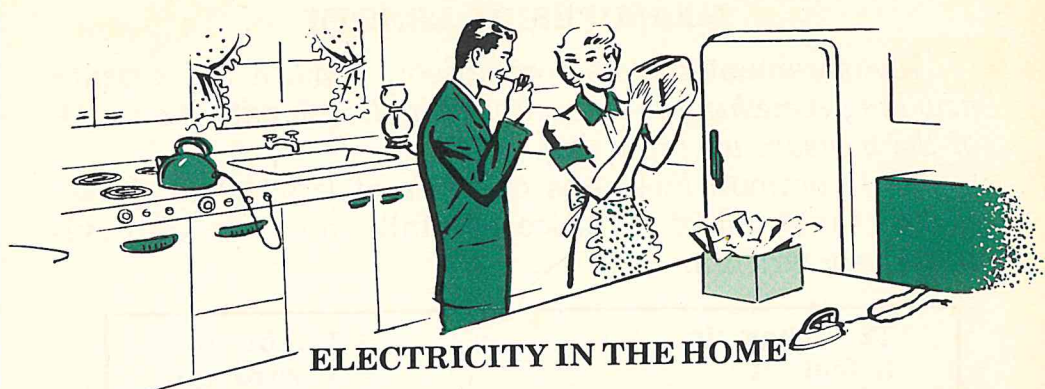
Check each answer.

1.	35	42	64	26	53	47	79
	48	96	87	39	88	76	54
	26	68	60	92	35	46	83
	93	35	43	47	92	58	68
	47	80	75	59	40	25	95
	<u>24</u>	<u>39</u>	<u>80</u>	<u>68</u>	<u>31</u>	<u>99</u>	<u>70</u>
2.	57	75	69	48	79	96	69
	26	39	72	97	58	38	45
	72	50	84	72	73	26	54
	78	88	50	85	35	60	13
	92	72	79	60	98	92	36
	<u>49</u>	<u>84</u>	<u>57</u>	<u>71</u>	<u>97</u>	<u>47</u>	<u>55</u>

MORE PRACTICE IN ADDITION

Add. Check each answer.

- | | | | | | | |
|----|---|---|---|---|--|---|
| 1. | 363
205
489
364
146
<u>487</u> | 585
736
384
428
780
<u>294</u> | 928
695
504
778
606
<u>515</u> | 177
744
292
639
482
<u>477</u> | 946
567
305
899
700
<u>692</u> | 604
358
476
940
982
<u>873</u> |
| 2. | 46
605
57
675
304
<u>539</u> | 754
39
287
105
24
<u>839</u> | 836
474
28
776
598
<u>39</u> | 84
905
67
690
756
<u>41</u> | 768
86
74
599
84
<u>849</u> | 75
887
174
60
881
<u>752</u> |
| 3. | 9579
5905
6523
6856
5502
<u>8678</u> | 3987
9336
6056
4967
9056
<u>9728</u> | 2546
5967
7074
8560
6821
<u>1138</u> | 6605
7079
4191
6998
7245
<u>2498</u> | 3964
3328
4604
9893
1240
<u>8987</u> | |
| 4. | 407
6895
508
3997
8451
<u>1986</u> | 5184
429
774
9569
5205
<u>346</u> | 85
4324
80
709
6183
<u>9755</u> | 898
3624
92
8430
55
<u>7707</u> | 77
2908
612
74
9649
<u>67</u> | |
| 5. | \$.89
.81
.27
.90
.64
<u>.91</u> | \$8.79
6.46
9.03
1.30
7.45
<u>3.14</u> | \$56.49
30.08
79.52
24.65
46.88
<u>35.47</u> | \$ 8.96
31.68
7.07
59.53
3.66
<u>80.30</u> | \$ 7.55
.46
65.60
.99
9.63
<u>91.11</u> | |



1. When Bob Tomson and his wife were married they received some nice presents from their friends. Among these presents were an electric iron, an electric toaster, and a floor lamp. If the iron cost \$12.95; the toaster, \$11.85; and the lamp, \$14.75, how much did these presents cost altogether?

2. When Bob and his wife moved into their new home, they bought an electric stove for \$198.00 and an electric refrigerator for \$299.50. How much did they pay for both?

3. The Tomsons' electric bills for five months were: July, \$4.08; August, \$4.67; September, \$4.49; October, \$5.17; and November, \$5.37. How much did they pay for the five months?

4. The Tomsons started to save to buy an electric washer, a vacuum cleaner, and a radio. If a washer costs \$143.25; a vacuum cleaner, \$84.50; and a radio, \$59.75, how much must they save to buy these things?

5. An electrical supply store sold 247 electric light bulbs in January; 385 in February; and 296 in March. How many electric light bulbs were sold in the three months?

MEASURES OF LENGTH

Measurement means comparison. *When we measure how long something is we compare its length with the length of the measure we are using.*

The common measures or units of length are shown in the table below. Notice carefully how the abbreviations are written.

12 inches (in.)	= 1 foot (ft.)
3 feet (ft.)	= 1 yard (yd.)
36 inches (in.)	= 1 yard (yd.)
16½ feet (ft.) or 5½ yards (yd.)	= 1 rod (rd.)
5280 feet (ft.)	= 1 mile (mi.)
1760 yards (yd.)	= 1 mile (mi.)
320 rods (rd.)	= 1 mile (mi.)

1. How long is this book? Your desk? Your classroom?

2. Everyone should be able to *estimate* distances; that is everyone should be able to tell *about how long* a distance is. Estimate how long your pencil is; how wide your desk is; how long the blackboard is. Check your estimates by accurate measurement.

3. Practise estimating distances in and out of school from day to day. Always check your estimate by measuring.

4. Sometimes we may want to know about how long something is when we have no measure of length with us. We can get a good idea of how long it is if we use the length of our *span* or the length of our normal *pace* to find out.

5. How long is your span? Your pace?

6. Practise measuring distances with your span and pace. To see how correct you are check by accurate measurement.

THE MEANING OF SUBTRACTION

When we "take-away" a smaller number from a larger number we *subtract*.

We subtract to find the answers to these questions:

1. How many are *left*, or how much is *left*?
2. How many *more*, or how much *more*, or how many *less*, *fewer*, etc.; how much *less*, *fewer*, etc. etc.
3. What is the *difference*?

The sign for subtraction is (—) which means "take-away" or "minus", or "less".

The number from which we subtract is the *minuend*. The number subtracted is the *subtrahend*. The answer in subtraction is the *difference* or the *remainder*.

To check subtraction add the subtrahend and the difference. If the sum is the same as the minuend, the subtraction is correct.

	<i>Subtract</i>
<u>684</u>	minuend
<u>327</u>	subtrahend
<u>357</u>	difference

	<i>Check</i>
<u>327</u>	subtrahend
<u>357</u>	difference
<u>684</u>	minuend

THINGS TO REMEMBER WHEN SUBTRACTING

Here are some things to remember when subtracting.

1. Make good clear figures.
2. Put the numbers to be subtracted directly under each other with the ones under the ones; the tens under the tens, etc.
3. Borrow when the figure in the minuend is smaller than the figure below it in the subtrahend.
4. When subtracting dollars and cents put the decimal points directly under each other, and put the decimal point in the answer directly under the decimal points above.
5. Check every exercise in subtraction.

PRACTICE IN SUBTRACTION

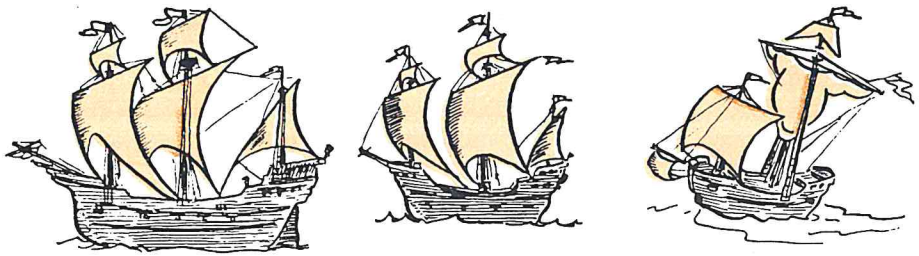
Subtract. Check each answer.

1.	$\begin{array}{r} 547 \\ -132 \\ \hline \end{array}$	$\begin{array}{r} 829 \\ -305 \\ \hline \end{array}$	$\begin{array}{r} 676 \\ -356 \\ \hline \end{array}$	$\begin{array}{r} 984 \\ -480 \\ \hline \end{array}$	$\begin{array}{r} 156 \\ -132 \\ \hline \end{array}$	$\begin{array}{r} 387 \\ -50 \\ \hline \end{array}$
2.	$\begin{array}{r} 129 \\ -52 \\ \hline \end{array}$	$\begin{array}{r} 136 \\ -94 \\ \hline \end{array}$	$\begin{array}{r} 154 \\ -72 \\ \hline \end{array}$	$\begin{array}{r} 118 \\ -80 \\ \hline \end{array}$	$\begin{array}{r} 149 \\ -66 \\ \hline \end{array}$	$\begin{array}{r} 172 \\ -92 \\ \hline \end{array}$
3.	$\begin{array}{r} 975 \\ -356 \\ \hline \end{array}$	$\begin{array}{r} 793 \\ -426 \\ \hline \end{array}$	$\begin{array}{r} 461 \\ -129 \\ \hline \end{array}$	$\begin{array}{r} 784 \\ -768 \\ \hline \end{array}$	$\begin{array}{r} 368 \\ -349 \\ \hline \end{array}$	$\begin{array}{r} 292 \\ -68 \\ \hline \end{array}$
4.	$\begin{array}{r} 710 \\ -450 \\ \hline \end{array}$	$\begin{array}{r} 553 \\ -392 \\ \hline \end{array}$	$\begin{array}{r} 947 \\ -763 \\ \hline \end{array}$	$\begin{array}{r} 724 \\ -134 \\ \hline \end{array}$	$\begin{array}{r} 339 \\ -247 \\ \hline \end{array}$	$\begin{array}{r} 676 \\ -580 \\ \hline \end{array}$
5.	$\begin{array}{r} 541 \\ -256 \\ \hline \end{array}$	$\begin{array}{r} 864 \\ -589 \\ \hline \end{array}$	$\begin{array}{r} 483 \\ -387 \\ \hline \end{array}$	$\begin{array}{r} 958 \\ -179 \\ \hline \end{array}$	$\begin{array}{r} 964 \\ -465 \\ \hline \end{array}$	$\begin{array}{r} 731 \\ -694 \\ \hline \end{array}$
6.	$\begin{array}{r} 472 \\ -185 \\ \hline \end{array}$	$\begin{array}{r} 826 \\ -737 \\ \hline \end{array}$	$\begin{array}{r} 123 \\ -78 \\ \hline \end{array}$	$\begin{array}{r} 646 \\ -589 \\ \hline \end{array}$	$\begin{array}{r} 122 \\ -27 \\ \hline \end{array}$	$\begin{array}{r} 437 \\ -49 \\ \hline \end{array}$
7.	$\begin{array}{r} 960 \\ -134 \\ \hline \end{array}$	$\begin{array}{r} 870 \\ -527 \\ \hline \end{array}$	$\begin{array}{r} 490 \\ -433 \\ \hline \end{array}$	$\begin{array}{r} 807 \\ -122 \\ \hline \end{array}$	$\begin{array}{r} 205 \\ -164 \\ \hline \end{array}$	$\begin{array}{r} 660 \\ -265 \\ \hline \end{array}$
8.	$\begin{array}{r} 730 \\ -451 \\ \hline \end{array}$	$\begin{array}{r} 620 \\ -598 \\ \hline \end{array}$	$\begin{array}{r} 230 \\ -64 \\ \hline \end{array}$	$\begin{array}{r} 700 \\ -352 \\ \hline \end{array}$	$\begin{array}{r} 400 \\ -236 \\ \hline \end{array}$	$\begin{array}{r} 500 \\ -474 \\ \hline \end{array}$
9.	$\begin{array}{r} 1616 \\ -856 \\ \hline \end{array}$	$\begin{array}{r} 1170 \\ -343 \\ \hline \end{array}$	$\begin{array}{r} 1561 \\ -914 \\ \hline \end{array}$	$\begin{array}{r} 1425 \\ -790 \\ \hline \end{array}$	$\begin{array}{r} 1535 \\ -776 \\ \hline \end{array}$	
10.	$\begin{array}{r} 1200 \\ -229 \\ \hline \end{array}$	$\begin{array}{r} 1348 \\ -888 \\ \hline \end{array}$	$\begin{array}{r} 1193 \\ -745 \\ \hline \end{array}$	$\begin{array}{r} 1700 \\ -746 \\ \hline \end{array}$	$\begin{array}{r} 1875 \\ -969 \\ \hline \end{array}$	
11.	$\begin{array}{r} \$6.24 \\ -2.56 \\ \hline \end{array}$	$\begin{array}{r} \$4.00 \\ -3.87 \\ \hline \end{array}$	$\begin{array}{r} \$16.40 \\ -8.72 \\ \hline \end{array}$	$\begin{array}{r} \$11.83 \\ -5.94 \\ \hline \end{array}$	$\begin{array}{r} \$15.22 \\ -9.50 \\ \hline \end{array}$	

SUBTRACTING LARGER NUMBERS

Subtract. Check each answer.

1.	$\begin{array}{r} 5384 \\ 1946 \\ \hline \end{array}$	$\begin{array}{r} 9425 \\ 6869 \\ \hline \end{array}$	$\begin{array}{r} 6041 \\ 4394 \\ \hline \end{array}$	$\begin{array}{r} 8400 \\ 5615 \\ \hline \end{array}$	$\begin{array}{r} 3519 \\ 2786 \\ \hline \end{array}$
2.	$\begin{array}{r} 8573 \\ 3894 \\ \hline \end{array}$	$\begin{array}{r} 4700 \\ 3966 \\ \hline \end{array}$	$\begin{array}{r} 6348 \\ 3452 \\ \hline \end{array}$	$\begin{array}{r} 2727 \\ 1758 \\ \hline \end{array}$	$\begin{array}{r} 4872 \\ 3955 \\ \hline \end{array}$
3.	$\begin{array}{r} 94462 \\ 51625 \\ \hline \end{array}$	$\begin{array}{r} 71528 \\ 28337 \\ \hline \end{array}$	$\begin{array}{r} 84360 \\ 42748 \\ \hline \end{array}$	$\begin{array}{r} 62406 \\ 59243 \\ \hline \end{array}$	$\begin{array}{r} 19045 \\ 12617 \\ \hline \end{array}$
4.	$\begin{array}{r} 96637 \\ 23654 \\ \hline \end{array}$	$\begin{array}{r} 49871 \\ 41777 \\ \hline \end{array}$	$\begin{array}{r} 69508 \\ 65678 \\ \hline \end{array}$	$\begin{array}{r} 98303 \\ 52710 \\ \hline \end{array}$	$\begin{array}{r} 75043 \\ 72692 \\ \hline \end{array}$
5.	$\begin{array}{r} 56429 \\ 38647 \\ \hline \end{array}$	$\begin{array}{r} 96274 \\ 35685 \\ \hline \end{array}$	$\begin{array}{r} 36309 \\ 27639 \\ \hline \end{array}$	$\begin{array}{r} 57022 \\ 44437 \\ \hline \end{array}$	$\begin{array}{r} 58403 \\ 19750 \\ \hline \end{array}$
6.	$\begin{array}{r} 34257 \\ 16398 \\ \hline \end{array}$	$\begin{array}{r} 63633 \\ 26984 \\ \hline \end{array}$	$\begin{array}{r} 98501 \\ 88629 \\ \hline \end{array}$	$\begin{array}{r} 30528 \\ 18559 \\ \hline \end{array}$	$\begin{array}{r} 45045 \\ 38758 \\ \hline \end{array}$
7.	$\begin{array}{r} 85931 \\ 66947 \\ \hline \end{array}$	$\begin{array}{r} 74623 \\ 68649 \\ \hline \end{array}$	$\begin{array}{r} 55200 \\ 27356 \\ \hline \end{array}$	$\begin{array}{r} 28002 \\ 19885 \\ \hline \end{array}$	$\begin{array}{r} 60061 \\ 34168 \\ \hline \end{array}$
8.	$\begin{array}{r} 43080 \\ 26702 \\ \hline \end{array}$	$\begin{array}{r} 70206 \\ 10909 \\ \hline \end{array}$	$\begin{array}{r} 94000 \\ 87089 \\ \hline \end{array}$	$\begin{array}{r} 54080 \\ 26401 \\ \hline \end{array}$	$\begin{array}{r} 70000 \\ 56005 \\ \hline \end{array}$
9.	$\begin{array}{r} 40603 \\ 17038 \\ \hline \end{array}$	$\begin{array}{r} 80004 \\ 57029 \\ \hline \end{array}$	$\begin{array}{r} 70700 \\ 20039 \\ \hline \end{array}$	$\begin{array}{r} 80006 \\ 60237 \\ \hline \end{array}$	$\begin{array}{r} 20000 \\ 10088 \\ \hline \end{array}$
10.	$\begin{array}{r} \$56.23 \\ 29.76 \\ \hline \end{array}$	$\begin{array}{r} \$33.70 \\ 29.83 \\ \hline \end{array}$	$\begin{array}{r} \$78.08 \\ 38.45 \\ \hline \end{array}$	$\begin{array}{r} \$602.00 \\ 336.56 \\ \hline \end{array}$	$\begin{array}{r} \$300.02 \\ 200.47 \\ \hline \end{array}$



EXPLORERS OF THE NEW WORLD

The New World, of which Canada is a very important part, was discovered by brave men who crossed from Europe over the unknown seas. Their names should be known to us all.

1. Every school child knows that Christopher Columbus discovered America in 1492. How many years ago is that?

2. Jacques Cartier sailed from St. Malo, France, and discovered the great St. Lawrence River in 1535. How many years was that after Columbus discovered America?

3. John Cabot who sailed from Bristol, England, discovered Newfoundland in 1497. Newfoundland became a province of Canada in 1949. How many years was that after Cabot discovered Newfoundland?

4. The four provinces of Nova Scotia, New Brunswick, Quebec, and Ontario joined together to form the Dominion of Canada on July 1, 1867. How old will the Dominion be next July 1?

5. Sir John A. Macdonald, the first prime minister of Canada, was born in 1815 and died in 1891. How old was he when he died?

6. The population of Canada in 1871 was 3,689,257. In 1954 Canada's population was about 15,195,000. About how many more were there in Canada in 1954 than in 1871?

PERSONAL ACCOUNTS

All boys and girls should keep a *personal account* of the money they are given or earn and of how they spend their money. Keeping a personal account helps a boy or girl to use money wisely.

To keep her personal account for July, Sally ruled a page of a note-book as shown below.

Cash Received				Cash Paid Out			
July	1	Carried forward	65	July	3	Ice cream	15
"	5	Allowance	50	"	7	Bathing suit	98
"	9	Baby sitting	40	"	13	Book	75
"	12	Allowance	50	"	17	Father's day	1 25
"	18	Selling berries	75	"	23	Movie	20
"	19	Allowance	50	"	27	Hair ribbon	25
"	22	Running errand	15				3 58
"	25	Sold doll carriage	1 25				
"	26	Allowance	50				
		Total.	5 20				
Aug.	1	Carried forward	1 62				

On the left under "Cash Received" Sally entered the dates, how she got the money, and the amounts she received. The first item, "Carried forward" shows the amount she had on July 1.

On the right under "Cash Paid Out" she entered the dates, what she spent the money on, and the amounts paid out.

At the end of July Sally *balanced* her account. To do this she added the amounts she received and the amounts she paid out. She subtracted the total amount she paid out (\$3.58) from the total amount she received (\$5.20) and she found she had a *balance* of \$1.62.

Then Sally started her personal account for the month of August by carrying forward this balance (\$1.62) as shown by the entry for August 1.

Do You Keep a Personal Account? If not, start now.

PERSONAL ACCOUNTS

1. All business men, store-keepers, doctors, lawyers, etc., keep account of the money they take in and the money they pay out. Give reasons for this.

2. Thrifty housewives keep account of grocery bills, etc. every month. Why is this a good idea?

3. Give as many reasons as you can why a boy or girl is wise to keep a personal account.

Rule out in your note-book a form like the one on page 15 and make out the personal account below.

4. Paul's personal account for the month of March.

Cash Received		Cash Paid Out	
Mar. 1	Carried forward \$1.35	Mar. 3	Skates sharpened \$.35
Mar. 6	Allowance .60	Mar. 9	Movie .20
Mar. 10	Shovelling walk .25	Mar. 15	Book .85
Mar. 13	Allowance .60	Mar. 19	Hockey match .50
Mar. 13	Present from aunt 1.50	Mar. 25	Gloves 1.75
Mar. 20	Allowance .60	Mar. 29	Club dues .25
Mar. 24	Carrying ashes .35		
Mar. 27	Allowance .60		

How much did Paul have to carry forward on April 1?

5. Lillian's personal account for November.

Cash Received		Cash Paid Out	
Nov. 1	Carried forward \$.45	Nov. 4	Ice-cream \$.15
Nov. 3	House cleaning .50	Nov. 9	Present for baby .20
Nov. 7	Allowance .45	Nov. 15	Rubbers .85
Nov. 10	Baby sitting .40	Nov. 22	Movie .15
Nov. 14	Allowance .45	Nov. 25	Bracelet .75
Nov. 21	Allowance .45	Nov. 29	Skating .25
Nov. 25	Errand .20		
Nov. 28	Allowance .45		

What was Lillian's balance for the month of November?

WRITING A RECEIPT

Mr. Stone pays \$4.50 a month for the garage he rents from Tony's father. When Mr. Stone called to pay the rent last month Tony's father was not at home, so Mr. Stone paid the \$4.50 to Tony and he asked for a *receipt*. Tony did not have a printed receipt form so he wrote the receipt on a piece of paper as shown below.

Windsor, N.S., Aug. 1, 1956
Received from A. J. Stone
Four dollars $\frac{50}{100}$ (\$4.50)
for garage rent to Aug. 1
Tony Grayson

A correctly written receipt should include the following items: (1) the place and date; (2) the name of the person who pays the money; (3) the amount paid both in words and in figures; (4) the purpose for which the money is being paid, and (5) the signature of the person who receives the money.

Whenever you pay another person money *insist on getting a receipt* for it. Then *be sure to save the receipt*. If you lose the receipt it may happen that you will have to pay the money again. Write a receipt for each of the following:

1. On May 16, 1956, Bobby Jones paid Teddy Young \$4.50 for a second-hand radio.
2. On June 20, 1956, Mrs. J. M. Mason paid Millie Fraser \$11.00 for house-work.
3. On September 4, Neil R. Bird paid L. M. Samson \$42.75 wages for repairs to barn.
4. Suppose your seat-mate pays you 50 cents today for something you sold him. Write a receipt supplying all the items that should be included.

THE MEANING OF MULTIPLICATION

Multiplication is a short way of adding numbers that are the same. $3 \times 9 = 27$ is a short way to find $9 + 9 + 9 = 27$.

$$\begin{array}{r} 56 \\ \times 4 \\ \hline 224 \end{array}$$
 is a short way of finding $56 + 56 + 56 + 56 = 224$

The sign for multiplication is $\times$. It is read *multiplied by* or *times*.

73	multiplicand
25	multiplier
365	partial product
146	partial product
1825	product

Look at the example on the left. It means 73 taken 25 times.

The number which is multiplied is the *multiplicand*. The number by which we multiply is the *multiplier*. The answer in multiplication is the *product*. In this example the *partial products* are added to give the product.

THINGS TO REMEMBER WHEN MULTIPLYING

Here are some things to remember when multiplying.

1. Make good clear figures.
2. Write the product figures so that the ones are under the ones, the tens under the tens, etc.
3. Write the first figure of a product or partial product directly under the figure by which you multiply.
4. When you carry in multiplication, multiply first and then add the carry number.
5. Zero multiplied by any number is zero.
6. When multiplying dollars and cents put a decimal point in the product two places from the right to separate the dollars and cents.
7. Check multiplication by doing the multiplication over again.

PRACTICE IN MULTIPLICATION

Multiply.

Check each answer.

- | | | | | | |
|---|---|---|---|---|---|
| 1. $\begin{array}{r} 532 \\ \underline{3} \end{array}$ | 620
$\begin{array}{r} \underline{4} \end{array}$ | 301
$\begin{array}{r} \underline{5} \end{array}$ | 715
$\begin{array}{r} \underline{6} \end{array}$ | 406
$\begin{array}{r} \underline{8} \end{array}$ | 519
$\begin{array}{r} \underline{4} \end{array}$ |
| 2. $\begin{array}{r} 908 \\ \underline{7} \end{array}$ | 461
$\begin{array}{r} \underline{5} \end{array}$ | 782
$\begin{array}{r} \underline{4} \end{array}$ | 860
$\begin{array}{r} \underline{6} \end{array}$ | 950
$\begin{array}{r} \underline{9} \end{array}$ | 571
$\begin{array}{r} \underline{8} \end{array}$ |
| 3. $\begin{array}{r} 376 \\ \underline{2} \end{array}$ | 493
$\begin{array}{r} \underline{6} \end{array}$ | 478
$\begin{array}{r} \underline{3} \end{array}$ | 245
$\begin{array}{r} \underline{7} \end{array}$ | 738
$\begin{array}{r} \underline{4} \end{array}$ | 246
$\begin{array}{r} \underline{9} \end{array}$ |
| 4. $\begin{array}{r} 328 \\ \underline{8} \end{array}$ | 789
$\begin{array}{r} \underline{5} \end{array}$ | 783
$\begin{array}{r} \underline{9} \end{array}$ | 827
$\begin{array}{r} \underline{6} \end{array}$ | 495
$\begin{array}{r} \underline{8} \end{array}$ | 679
$\begin{array}{r} \underline{7} \end{array}$ |
| 5. $\begin{array}{r} 9132 \\ \underline{4} \end{array}$ | 7140
$\begin{array}{r} \underline{6} \end{array}$ | 6012
$\begin{array}{r} \underline{8} \end{array}$ | 4116
$\begin{array}{r} \underline{5} \end{array}$ | 8031
$\begin{array}{r} \underline{7} \end{array}$ | |
| 6. $\begin{array}{r} 3496 \\ \underline{3} \end{array}$ | 2567
$\begin{array}{r} \underline{5} \end{array}$ | 3798
$\begin{array}{r} \underline{8} \end{array}$ | 1375
$\begin{array}{r} \underline{9} \end{array}$ | 2746
$\begin{array}{r} \underline{7} \end{array}$ | |
| 7. $\begin{array}{r} 4658 \\ \underline{6} \end{array}$ | 3497
$\begin{array}{r} \underline{4} \end{array}$ | 2896
$\begin{array}{r} \underline{9} \end{array}$ | 3985
$\begin{array}{r} \underline{7} \end{array}$ | 7569
$\begin{array}{r} \underline{8} \end{array}$ | |
| 8. $\begin{array}{r} 2070 \\ \underline{4} \end{array}$ | 3050
$\begin{array}{r} \underline{7} \end{array}$ | 6008
$\begin{array}{r} \underline{5} \end{array}$ | 1009
$\begin{array}{r} \underline{8} \end{array}$ | 9008
$\begin{array}{r} \underline{6} \end{array}$ | |
| 9. $\begin{array}{r} \$.15 \\ \underline{6} \end{array}$ | \$.13
$\begin{array}{r} \underline{5} \end{array}$ | \$2.14
$\begin{array}{r} \underline{4} \end{array}$ | \$6.70
$\begin{array}{r} \underline{7} \end{array}$ | \$4.08
$\begin{array}{r} \underline{9} \end{array}$ | |
| 10. $\begin{array}{r} \$3.48 \\ \underline{8} \end{array}$ | \$8.39
$\begin{array}{r} \underline{6} \end{array}$ | \$13.67
$\begin{array}{r} \underline{9} \end{array}$ | \$43.98
$\begin{array}{r} \underline{7} \end{array}$ | \$72.86
$\begin{array}{r} \underline{8} \end{array}$ | |
| 11. $\begin{array}{r} \$29.15 \\ \underline{5} \end{array}$ | \$81.40
$\begin{array}{r} \underline{7} \end{array}$ | \$30.70
$\begin{array}{r} \underline{8} \end{array}$ | \$40.06
$\begin{array}{r} \underline{9} \end{array}$ | \$60.09
$\begin{array}{r} \underline{7} \end{array}$ | |

MULTIPLYING BY TWO AND THREE-FIGURE MULTIPLIERS

Multiply. Check each answer.

1.
$$\begin{array}{r} 43 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 65 \\ 23 \\ \hline \end{array}$$

$$\begin{array}{r} 78 \\ 31 \\ \hline \end{array}$$

$$\begin{array}{r} 67 \\ 49 \\ \hline \end{array}$$

$$\begin{array}{r} 89 \\ 38 \\ \hline \end{array}$$

$$\begin{array}{r} 59 \\ 57 \\ \hline \end{array}$$

$$\begin{array}{r} 94 \\ 69 \\ \hline \end{array}$$
2.
$$\begin{array}{r} 74 \\ 58 \\ \hline \end{array}$$

$$\begin{array}{r} 95 \\ 76 \\ \hline \end{array}$$

$$\begin{array}{r} 85 \\ 94 \\ \hline \end{array}$$

$$\begin{array}{r} 68 \\ 65 \\ \hline \end{array}$$

$$\begin{array}{r} 92 \\ 83 \\ \hline \end{array}$$

$$\begin{array}{r} 39 \\ 19 \\ \hline \end{array}$$

$$\begin{array}{r} 86 \\ 87 \\ \hline \end{array}$$
3.
$$\begin{array}{r} 123 \\ 15 \\ \hline \end{array}$$

$$\begin{array}{r} 156 \\ 32 \\ \hline \end{array}$$

$$\begin{array}{r} 347 \\ 46 \\ \hline \end{array}$$

$$\begin{array}{r} 278 \\ 29 \\ \hline \end{array}$$

$$\begin{array}{r} 359 \\ 58 \\ \hline \end{array}$$

$$\begin{array}{r} 258 \\ 67 \\ \hline \end{array}$$
4.
$$\begin{array}{r} 462 \\ 84 \\ \hline \end{array}$$

$$\begin{array}{r} 347 \\ 79 \\ \hline \end{array}$$

$$\begin{array}{r} 569 \\ 96 \\ \hline \end{array}$$

$$\begin{array}{r} 785 \\ 68 \\ \hline \end{array}$$

$$\begin{array}{r} 867 \\ 97 \\ \hline \end{array}$$

$$\begin{array}{r} 954 \\ 89 \\ \hline \end{array}$$
5.
$$\begin{array}{r} 1436 \\ 17 \\ \hline \end{array}$$

$$\begin{array}{r} 3197 \\ 43 \\ \hline \end{array}$$

$$\begin{array}{r} 5836 \\ 58 \\ \hline \end{array}$$

$$\begin{array}{r} 2879 \\ 76 \\ \hline \end{array}$$

$$\begin{array}{r} 3628 \\ 92 \\ \hline \end{array}$$
6.
$$\begin{array}{r} 153 \\ 132 \\ \hline \end{array}$$

$$\begin{array}{r} 216 \\ 154 \\ \hline \end{array}$$

$$\begin{array}{r} 473 \\ 247 \\ \hline \end{array}$$

$$\begin{array}{r} 385 \\ 168 \\ \hline \end{array}$$

$$\begin{array}{r} 692 \\ 394 \\ \hline \end{array}$$

$$\begin{array}{r} 594 \\ 286 \\ \hline \end{array}$$
7.
$$\begin{array}{r} 721 \\ 384 \\ \hline \end{array}$$

$$\begin{array}{r} 649 \\ 426 \\ \hline \end{array}$$

$$\begin{array}{r} 856 \\ 518 \\ \hline \end{array}$$

$$\begin{array}{r} 737 \\ 796 \\ \hline \end{array}$$

$$\begin{array}{r} 569 \\ 487 \\ \hline \end{array}$$

$$\begin{array}{r} 804 \\ 639 \\ \hline \end{array}$$
8.
$$\begin{array}{r} 790 \\ 245 \\ \hline \end{array}$$

$$\begin{array}{r} 307 \\ 387 \\ \hline \end{array}$$

$$\begin{array}{r} 974 \\ 961 \\ \hline \end{array}$$

$$\begin{array}{r} 704 \\ 548 \\ \hline \end{array}$$

$$\begin{array}{r} 950 \\ 679 \\ \hline \end{array}$$

$$\begin{array}{r} 802 \\ 468 \\ \hline \end{array}$$
9.
$$\begin{array}{r} \$.15 \\ 13 \\ \hline \end{array}$$

$$\begin{array}{r} \$.18 \\ 42 \\ \hline \end{array}$$

$$\begin{array}{r} \$.25 \\ 19 \\ \hline \end{array}$$

$$\begin{array}{r} \$2.68 \\ 57 \\ \hline \end{array}$$

$$\begin{array}{r} \$6.37 \\ 36 \\ \hline \end{array}$$
10.
$$\begin{array}{r} \$4.69 \\ 48 \\ \hline \end{array}$$

$$\begin{array}{r} \$7.94 \\ 95 \\ \hline \end{array}$$

$$\begin{array}{r} \$16.27 \\ 16 \\ \hline \end{array}$$

$$\begin{array}{r} \$24.07 \\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} \$60.30 \\ 59 \\ \hline \end{array}$$
11.
$$\begin{array}{r} \$3.19 \\ 241 \\ \hline \end{array}$$

$$\begin{array}{r} \$5.84 \\ 156 \\ \hline \end{array}$$

$$\begin{array}{r} \$6.50 \\ 387 \\ \hline \end{array}$$

$$\begin{array}{r} \$7.08 \\ 493 \\ \hline \end{array}$$

$$\begin{array}{r} \$9.07 \\ 584 \\ \hline \end{array}$$

MULTIPLYING WITH ZEROS IN THE MULTIPLIER

Any number (no matter how large the number is) multiplied by zero is zero. Remember this when there are zeros in the multiplier.

Tell how the examples below are done.

$$\begin{array}{r} 67 \\ \times 40 \\ \hline 2680 \end{array}$$

$$\begin{array}{r} 382 \\ \times 260 \\ \hline 22920 \\ 764 \\ \hline 99320 \end{array}$$

$$\begin{array}{r} 735 \\ 307 \\ \hline 5145 \\ 22050 \\ \hline 225645 \end{array}$$

Multiply. Check each answer.

1.	$\begin{array}{r} 58 \\ 20 \\ \hline \end{array}$	$\begin{array}{r} 65 \\ 40 \\ \hline \end{array}$	$\begin{array}{r} 83 \\ 60 \\ \hline \end{array}$	$\begin{array}{r} 95 \\ 50 \\ \hline \end{array}$	$\begin{array}{r} 73 \\ 80 \\ \hline \end{array}$	$\begin{array}{r} 46 \\ 30 \\ \hline \end{array}$	$\begin{array}{r} 82 \\ 90 \\ \hline \end{array}$
----	---	---	---	---	---	---	---

2.	$\begin{array}{r} 358 \\ 300 \\ \hline \end{array}$	$\begin{array}{r} 629 \\ 500 \\ \hline \end{array}$	$\begin{array}{r} 571 \\ 200 \\ \hline \end{array}$	$\begin{array}{r} 648 \\ 800 \\ \hline \end{array}$	$\begin{array}{r} 386 \\ 700 \\ \hline \end{array}$	$\begin{array}{r} 917 \\ 600 \\ \hline \end{array}$
----	---	---	---	---	---	---

3.	$\begin{array}{r} 216 \\ 140 \\ \hline \end{array}$	$\begin{array}{r} 473 \\ 320 \\ \hline \end{array}$	$\begin{array}{r} 508 \\ 460 \\ \hline \end{array}$	$\begin{array}{r} 746 \\ 750 \\ \hline \end{array}$	$\begin{array}{r} 839 \\ 590 \\ \hline \end{array}$	$\begin{array}{r} 675 \\ 380 \\ \hline \end{array}$
----	---	---	---	---	---	---

4.	$\begin{array}{r} 406 \\ 260 \\ \hline \end{array}$	$\begin{array}{r} 276 \\ 190 \\ \hline \end{array}$	$\begin{array}{r} 903 \\ 810 \\ \hline \end{array}$	$\begin{array}{r} 747 \\ 690 \\ \hline \end{array}$	$\begin{array}{r} 689 \\ 730 \\ \hline \end{array}$	$\begin{array}{r} 769 \\ 950 \\ \hline \end{array}$
----	---	---	---	---	---	---

5.	$\begin{array}{r} 259 \\ 203 \\ \hline \end{array}$	$\begin{array}{r} 348 \\ 405 \\ \hline \end{array}$	$\begin{array}{r} 592 \\ 306 \\ \hline \end{array}$	$\begin{array}{r} 495 \\ 709 \\ \hline \end{array}$	$\begin{array}{r} 752 \\ 507 \\ \hline \end{array}$	$\begin{array}{r} 849 \\ 608 \\ \hline \end{array}$
----	---	---	---	---	---	---

6.	$\begin{array}{r} 357 \\ 304 \\ \hline \end{array}$	$\begin{array}{r} 563 \\ 609 \\ \hline \end{array}$	$\begin{array}{r} 425 \\ 804 \\ \hline \end{array}$	$\begin{array}{r} 736 \\ 702 \\ \hline \end{array}$	$\begin{array}{r} 376 \\ 508 \\ \hline \end{array}$	$\begin{array}{r} 592 \\ 209 \\ \hline \end{array}$
----	---	---	---	---	---	---

7.	$\begin{array}{r} 459 \\ 705 \\ \hline \end{array}$	$\begin{array}{r} 895 \\ 308 \\ \hline \end{array}$	$\begin{array}{r} 438 \\ 905 \\ \hline \end{array}$	$\begin{array}{r} 863 \\ 607 \\ \hline \end{array}$	$\begin{array}{r} 672 \\ 802 \\ \hline \end{array}$	$\begin{array}{r} 516 \\ 904 \\ \hline \end{array}$
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8.	$\begin{array}{r} 547 \\ 400 \\ \hline \end{array}$	$\begin{array}{r} 736 \\ 600 \\ \hline \end{array}$	$\begin{array}{r} 329 \\ 170 \\ \hline \end{array}$	$\begin{array}{r} 872 \\ 540 \\ \hline \end{array}$	$\begin{array}{r} 468 \\ 308 \\ \hline \end{array}$	$\begin{array}{r} 925 \\ 709 \\ \hline \end{array}$
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PROBLEMS USING MULTIPLICATION

1. Mary bought 3 bottles of mixed pickles at the corner store. How much did Mary pay for them if the pickles cost 29¢ a bottle?
2. Mrs. Robbin ordered 4 lb. of steak at 58¢ a pound. How much did she pay for the steak?
3. John's mother bought 6 pairs of flannelette blankets for her summer camp. How much did they cost her if the blankets sold for \$4.05 a pair?
4. A grocer ordered 15 cases of canned apple juice. If there were 24 cans in a case, how many cans of apple juice did he have to sell?
5. A strawberry grower sold 46 crates of strawberries to a market. How many boxes of strawberries did he sell if there were 27 boxes in a crate?
6. In a movie theatre there are 38 rows of seats and there are 26 seats in each row. How many people will the theatre seat?
7. Norma's father works 40 hours a week. If he earns \$1.45 an hour, how much does he earn in a week?
8. How many miles will an airplane travel in 13 hr. if it travels at the rate of 245 mi. an hour?
9. A wholesale fruit dealer received a shipment of 278 crates of oranges. If there were 344 oranges to a crate, how many oranges were there in the shipment?
10. A department store sold 230 kiddies' snow-suits at \$6.49 each. How much money did they take in for the snow-suits?
11. Mr. Morrow is a potato farmer. Last week he sold 306 bu. of potatoes at \$1.43 a bushel. How much did he receive for the potatoes?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	2804	7972	4756	9365	6849
	3435	3595	6478	5589	5293
	8856	5456	3502	7154	8074
	1523	6640	3956	8375	3670
	6767	2984	5625	3492	5352
	<u>3645</u>	<u>3532</u>	<u>1764</u>	<u>7053</u>	<u>2192</u>
2.	3695	544	4276	947	4586
	256	8409	828	7809	7736
	7396	1432	7072	5333	197
	630	819	746	155	720
	6468	8592	1683	487	1182
	<u>3486</u>	<u>644</u>	<u>230</u>	<u>9509</u>	<u>4891</u>

Subtract. Check each exercise.

3.	12845	14561	11837	10600	17050
	<u>7573</u>	<u>6046</u>	<u>9269</u>	<u>7534</u>	<u>7821</u>
4.	94571	84774	97260	86527	19045
	<u>61644</u>	<u>24583</u>	<u>47429</u>	<u>79196</u>	<u>15539</u>
5.	95235	47614	53519	74373	33815
	<u>13743</u>	<u>23575</u>	<u>23975</u>	<u>61679</u>	<u>24845</u>
6.	84153	58122	62430	48500	73608
	<u>25597</u>	<u>38666</u>	<u>38673</u>	<u>39721</u>	<u>65849</u>
7.	45050	60303	82000	67040	40000
	<u>26507</u>	<u>40606</u>	<u>77058</u>	<u>29603</u>	<u>16831</u>
8.	13140	45061	62947	50000	90202
	<u>5916</u>	<u>39285</u>	<u>24968</u>	<u>45924</u>	<u>84109</u>

MEASURES OF CAPACITY

To measure *liquids*, like milk, molasses, vinegar, gasoline, etc., we use *liquid measures* of capacity. These measures are usually, bottles, jars, wax paper containers, or tin cans.

The liquid measures or units of capacity are shown in the table below. Notice the abbreviations.

LIQUID MEASURES			
* 2½ standard measuring cups	=	1 imperial pint (pt.)	
(2 standard measuring cups	=	1 U.S. pint)	
2 pints (pt.)	=	1 quart (qt.)	
4 quarts (qt.)	=	1 gallon (gal.)	

1. If motor oil costs 45¢ a quart, how much will a gallon cost?

2. Mr. Ware, the grocer, bought a 65 gallon keg of vinegar. If he put it up in pint bottles, how many bottles would he need?

To measure *dry things*, like berries and small fruits, grains, (oats, wheat, etc.) or vegetables (potatoes, turnips, etc.) we use *dry measures* of capacity. These measures are usually, boxes, baskets, or hampers.

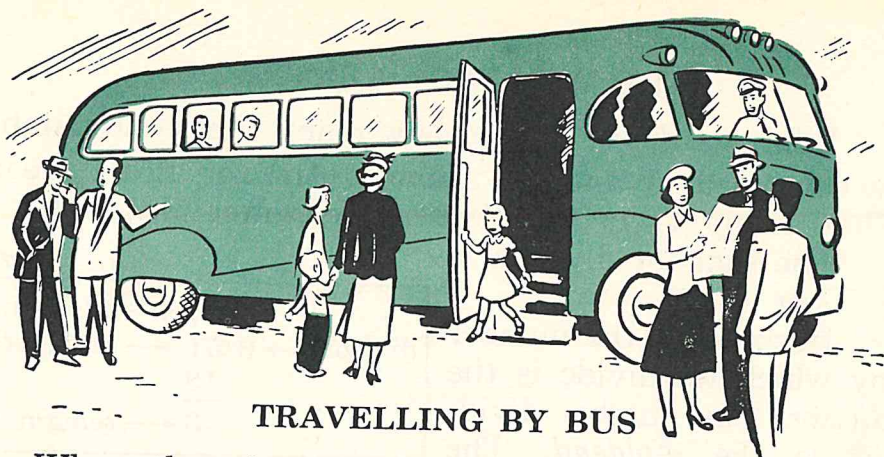
The dry measures or units of capacity are shown in the table below.

DRY MEASURES			
2 pints (pt.)	=	1 quart (qt.)	
8 quarts (qt.)	=	1 peck (pk.)	
4 pecks (pk.)	=	1 bushel (bu.)	

3. Bill has a pony. If he gives the pony a quart of oats a day, how long will a bushel of oats last?

4. How much will Mr. Mason get for 12 bu. of potatoes if he sells them at \$.47 a peck?

5. Get a liquid quart and a dry quart and find out for yourself whether or not they hold the same amount.



TRAVELLING BY BUS

Where there is no railway service many people travel by bus. The buses may pick up passengers on the highways. On long trips the bus stops to allow passengers to get meals; and on very long trips it may stop overnight.

1. Evelyn went by bus to visit her grandmother. If her bus fare was \$8.45 and she paid \$.75 for dinner and \$.65 for supper, how much did the trip cost?

2. On the bus Evelyn travelled there were 32 passengers. If the average fare paid by the passengers was \$4.15, how much did the bus company take in?

3. "Dusty" Robbins was the bus driver. He told Evelyn that he made 19 trips last month and that he drove 228 miles each trip. How many miles did he drive?

4. On a long bus trip Mr. Stevens travelled 1100 mi., and Mr. Watt travelled 753. How much farther did Mr. Stevens travel than Mr. Watt?

5. A church choir hired a bus to take them to Oxford, a distance of 60 miles from their homes. If the bus company charged 35¢ a mile for the bus, how much did it cost the choir to go to Oxford and return home?

6. "Frankie" Tobin is one of the best bus drivers. His bus carried 312 passengers one week; 297 passengers the next week; 285 the next, and 328 the next. How many passengers did his bus carry in the four weeks?

THE MEANING OF DIVISION

When we *divide* we find how many times one number is contained in another number. $4\overline{)12}$ or $12 \div 4$ means "how many 4's in 12". The answer, of course, is 3.

The sign for division is

$\overline{)}$ or $\div$

In division, the number by which we divide is the *divisor*. The number divided is the *dividend*. The answer is the *quotient*. The number left over, if any, is the *remainder*.

To *check* division, multiply the quotient by the divisor and add the remainder. If the answer is the same as the dividend the division is correct.

	8 ← quotient
divisor → 6	$\overline{)51}$ ← dividend
	48
	<u>3</u> ← remainder

Check:

	8 ← quotient
$\times 6$	← divisor
	48
$+ 3$	← remainder
	<u>51</u> ← dividend

THINGS TO REMEMBER WHEN DIVIDING

Here are some things to remember when dividing:

1. Make good clear figures.
2. When dividing start at the left.
3. Write the quotient figure (or figures) directly over the last figure of the dividend (or partial dividend).
4. The *product* of a quotient figure and the divisor *must not be greater than the dividend* (or partial dividend).
5. The *difference* (remainder) between a product and the dividend (or partial dividend) *must be less than the divisor*.
6. When a figure is *brought down* from the dividend, a figure *must be placed above it in the quotient*.
7. The remainder should be written in the quotient.
8. Always check the division.

DIVISION WITH CARRYING

Tom and his father drove 2275 miles on a 7 day automobile trip last summer. How many miles a day did they travel if they travelled the same distance each day?

To find how many miles they travelled each day we *divide* 2275 by 7.

To divide follow these steps.

1. *Divide.* The first *partial dividend* is 22. Think, "*7's in 22 are 3*". Write the 3 over the 2, the last figure of the partial dividend.

2. *Multiply.* $3 \times 7 = 21$.

3. *Compare.* The product, 21, cannot be greater than the partial dividend, 22.

4. *Subtract.* $22 - 21 = 1$.

5. *Compare.* The remainder, 1, must be less than the divisor.

6. *Bring down* the 7 from the dividend. The new partial dividend is 17.

7. **REMEMBER** *that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

Now follows steps 1 to 7 to divide 17 by 7 and again to divide 35 by 7.

So they drove 325 miles each day.

$$\begin{array}{r} 325 \\ 7 \overline{)2275} \\ \underline{21} \\ 17 \\ \underline{14} \\ 35 \\ \underline{35} \end{array}$$

Check:

$$\begin{array}{r} 325 \\ \times 7 \\ \hline 2275 \end{array}$$

To divide *dollars and cents* put a decimal point in the quotient directly over the decimal point in the dividend.



$$\begin{array}{r} \$1.34 \\ 6 \overline{)\$8.04} \\ \underline{6} \\ 20 \\ \underline{18} \\ 24 \\ \underline{24} \end{array}$$

PRACTICE IN DIVISION

Divide. Check each answer. If there is a remainder, write it to the right of the quotient.

- | | | | | |
|------------------------------|--------------------------|--------------------------|--------------------------|---------------------|
| 1. $4 \overline{)64}$ | $7 \overline{)89}$ | $3 \overline{)135}$ | $5 \overline{)377}$ | $8 \overline{)432}$ |
| 2. $3 \overline{)468}$ | $2 \overline{)973}$ | $5 \overline{)706}$ | $6 \overline{)696}$ | $4 \overline{)895}$ |
| 3. $2 \overline{)1356}$ | $6 \overline{)2745}$ | $7 \overline{)5168}$ | $5 \overline{)3845}$ | |
| 4. $8 \overline{)4904}$ | $7 \overline{)6857}$ | $9 \overline{)5345}$ | $6 \overline{)4436}$ | |
| 5. $4 \overline{)2524}$ | $7 \overline{)4629}$ | $5 \overline{)2708}$ | $8 \overline{)3768}$ | |
| 6. $6 \overline{)3429}$ | $9 \overline{)6759}$ | $7 \overline{)3718}$ | $6 \overline{)2046}$ | |
| 7. $3 \overline{)1852}$ | $7 \overline{)2891}$ | $5 \overline{)4580}$ | $8 \overline{)6491}$ | |
| 8. $7 \overline{)5684}$ | $8 \overline{)7293}$ | $6 \overline{)3681}$ | $7 \overline{)6379}$ | |
| 9. $2 \overline{)11573}$ | $4 \overline{)15156}$ | $3 \overline{)20631}$ | $5 \overline{)37432}$ | |
| 10. $6 \overline{)21954}$ | $8 \overline{)36278}$ | $7 \overline{)25526}$ | $9 \overline{)57852}$ | |
| 11. $5 \overline{)32967}$ | $7 \overline{)24396}$ | $6 \overline{)59772}$ | $8 \overline{)27793}$ | |
| 12. $6 \overline{)57674}$ | $8 \overline{)28091}$ | $5 \overline{)32584}$ | $7 \overline{)25294}$ | |
| 13. $4 \overline{)36756}$ | $7 \overline{)14876}$ | $6 \overline{)54945}$ | $8 \overline{)32968}$ | |
| 14. $3 \overline{)\$8.64}$ | $5 \overline{)\$17.85}$ | $4 \overline{)\$27.48}$ | $2 \overline{)\$11.96}$ | |
| 15. $6 \overline{)\$28.56}$ | $8 \overline{)\$46.72}$ | $9 \overline{)\$31.95}$ | $7 \overline{)\$52.64}$ | |
| 16. $5 \overline{)\$24.15}$ | $9 \overline{)\$57.87}$ | $6 \overline{)\$17.64}$ | $8 \overline{)\$70.32}$ | |
| 17. $4 \overline{)\$634.16}$ | $8 \overline{)\$954.56}$ | $7 \overline{)\$822.71}$ | $6 \overline{)\$985.62}$ | |
| 18. $7 \overline{)\$325.78}$ | $6 \overline{)\$206.82}$ | $8 \overline{)\$596.32}$ | $7 \overline{)\$248.85}$ | |

ZERO IN THE QUOTIENT

Be on the alert if zeros are needed in the quotient.

ZERO AT THE END OF THE QUOTIENT

Tell how each of these examples is done.

$$\begin{array}{r} 380R3 \\ 6 \overline{)2283} \\ \underline{18} \\ 48 \\ \underline{48} \\ 3 \end{array}$$

$$\begin{array}{r} 2400 \\ 7 \overline{)16800} \\ \underline{14} \\ 28 \\ \underline{28} \\ 00 \end{array}$$

Divide. Check each answer.

- | | | | | |
|--------------------------|--------------------------|------------------------|-------------------------|-------------------------|
| 1. $7 \overline{)140}$ | 3. $9 \overline{)92}$ | 5. $4 \overline{)403}$ | 6. $9 \overline{)960}$ | 9. $5 \overline{)545}$ |
| 2. $4 \overline{)720}$ | 8. $9 \overline{)964}$ | 6. $8 \overline{)841}$ | 7. $2 \overline{)2450}$ | 9. $3 \overline{)3872}$ |
| 3. $8 \overline{)4325}$ | 7. $1 \overline{)1960}$ | 9. $\$57.60$ | 6. $\$23.40$ | |
| 4. $5 \overline{)34500}$ | 8. $2 \overline{)21605}$ | 7. $\$455.00$ | 9. $\$594.00$ | |

ZERO IN THE MIDST OF THE QUOTIENT

Tell how each of these examples is done.

$$\begin{array}{r} 402R1 \\ 8 \overline{)3217} \\ \underline{32} \\ 17 \\ \underline{16} \\ 1 \end{array}$$

$$\begin{array}{r} 7008R2 \\ 5 \overline{)35042} \\ \underline{35} \\ 42 \\ \underline{40} \\ 2 \end{array}$$

Divide. Check each answer.

- | | | | | |
|--------------------------|-------------------------|-------------------------|------------------------|-------------|
| 5. $4 \overline{)824}$ | 3. $3 \overline{)617}$ | 6. $6 \overline{)642}$ | 2. $8 \overline{)811}$ | 8. $\$8.56$ |
| 6. $5 \overline{)1525}$ | 7. $7 \overline{)2839}$ | 8. $5 \overline{)5640}$ | 6. $\$4254$ | |
| 7. $9 \overline{)6322}$ | 8. $6 \overline{)472}$ | 6. $1 \overline{)8024}$ | 5. $\$350.25$ | |
| 8. $4 \overline{)36029}$ | 7. $2 \overline{)1068}$ | 8. $4 \overline{)0064}$ | 9. $\$27081$ | |
| 9. $5 \overline{)35450}$ | 6. $2 \overline{)4420}$ | 4. $2 \overline{)8123}$ | 7. $\$495.60$ | |

SHORT DIVISION

When the divisor is a one-figure number it often takes less time to do an exercise in division by using *short division*. Short division is a short cut.

HOW TO DO SHORT DIVISION

Divide 2745
by 6.

$$\begin{array}{r} 457R3 \\ 6 \overline{)2745} \end{array}$$

Check:

$$\begin{array}{r} 457 \\ \times 6 \\ \hline 2742 \\ + 3 \\ \hline 2745 \end{array}$$

Think, "6's in 27 are 4 with 3 left over".

Write the 4 over the 7.

Think, "3 in front of 4 makes 34. 6's in 34 are 5 with 4 left over". Write the 5 over the 4.

Think, "4 in front of 5 makes 45. 6's in 45 are 7 with 3 left over".

Write the 7 over the 5 and write the remainder 3 as shown.

Check the work as shown.

Divide using short division. Check each exercise.

- | | | | |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. $2 \overline{)1356}$ | 3. $3 \overline{)1425}$ | 5. $5 \overline{)1785}$ | 4. $4 \overline{)2312}$ |
| 2. $3 \overline{)2359}$ | 2. $2 \overline{)1191}$ | 4. $4 \overline{)2172}$ | 5. $5 \overline{)3246}$ |
| 3. $6 \overline{)2172}$ | 4. $4 \overline{)2558}$ | 7. $7 \overline{)3755}$ | 3. $3 \overline{)2875}$ |
| 4. $5 \overline{)1390}$ | 8. $8 \overline{)2768}$ | 6. $6 \overline{)4529}$ | 9. $9 \overline{)2196}$ |
| 5. $7 \overline{)5276}$ | 8. $8 \overline{)5969}$ | 9. $9 \overline{)6787}$ | 6. $6 \overline{)5852}$ |
| 6. $3 \overline{)1440}$ | 5. $5 \overline{)4350}$ | 4. $4 \overline{)2762}$ | 7. $7 \overline{)3015}$ |
| 7. $4 \overline{)3616}$ | 6. $6 \overline{)4224}$ | 9. $9 \overline{)8129}$ | 8. $8 \overline{)4065}$ |
| 8. $3 \overline{)27090}$ | 5. $5 \overline{)25051}$ | 4. $4 \overline{)32080}$ | 7. $7 \overline{)56072}$ |

PROBLEMS USING DIVISION

1. At the Boy Scouts' camp it was decided to have a basketball tournament. There were 65 boys at camp and each team was to have 5 players. How many basketball teams were in the tournament?

2. Mrs. Ryan bought 3 pairs of nylon stockings at a sale. If she paid \$4.17 for them, how much a pair did the stockings cost?

3. There were 876 men at the Reserve Army camp at Alton last July. If there were 6 men to a tent, how many tents were there altogether?

4. Mrs. Butts made strawberry short cake for the church picnic. She paid \$2.24 for 8 boxes of strawberries. How much did each box cost?

5. The Glee Club sold 657 tickets for their outdoor concert. The audience sat on benches with 9 persons on each bench. How many benches were needed to seat those who bought tickets?

6. The total cost of a fishing trip was \$21.75. If there were 5 boys on the trip and each paid the same amount, how much did each boy pay?

7. The Williams' factory uses 9 tons of coal a day. How long will a pile of 414 tons of coal last the factory?

8. A firm which makes Christmas bells packs them in boxes with 8 to a box. How many boxes are needed to pack 2451 Christmas bells and how many bells will be left over?

9. Mr. Ray bought 7 bus tickets for a group which was going to a convention. If he paid \$22.40 for the tickets, what was the price of each ticket?

10. Peter's father works 6 days a week. If his wages are \$36.96 a week, how much does he earn each day?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	8955	7466	1253	2055	867
	9674	1507	6048	983	8234
	5116	8243	5534	5178	3086
	7692	9850	2279	7844	720
	7233	5789	8564	856	197
	<u>5080</u>	<u>9885</u>	<u>1495</u>	<u>4460</u>	<u>7659</u>

Subtract. Check each answer.

2.	15727	11353	18874	12400	14040
	<u>8364</u>	<u>4024</u>	<u>9387</u>	<u>4325</u>	<u>4623</u>
3.	86418	78122	29478	81627	17440
	<u>34684</u>	<u>16023</u>	<u>22698</u>	<u>80850</u>	<u>14354</u>
4.	69711	85433	76628	25374	82619
	<u>21986</u>	<u>58482</u>	<u>69680</u>	<u>20985</u>	<u>72730</u>
5.	70203	55070	97000	84030	50000
	<u>40407</u>	<u>17708</u>	<u>88965</u>	<u>39308</u>	<u>31297</u>

Multiply. Check each answer.

6.	458	629	1497	2986	3475
	<u>7</u>	<u>6</u>	<u>4</u>	<u>8</u>	<u>9</u>
7.	80	83	69	95	248
	<u>20</u>	<u>60</u>	<u>47</u>	<u>85</u>	<u>39</u>
8.	392	768	359	723	684
	<u>124</u>	<u>538</u>	<u>300</u>	<u>570</u>	<u>408</u>
9.	\$4.08	\$6.09	\$.75	\$1.83	\$9.56
	<u>5</u>	<u>30</u>	<u>49</u>	<u>276</u>	<u>508</u>

PROBLEMS WITHOUT NUMBERS

When doing an arithmetic problem *always decide what you must do with the numbers before you do anything with them.* The problems below will give you practice in deciding what to do—*whether to add, subtract, multiply, or divide.*

1. If you know the price of a pound of coffee, what would you do to find the cost of several pounds?
2. Allan knows the prices of a baseball, a bat, and a catcher's mitt. What must Allan do to find how much they would cost if he bought them all?
3. Mrs. White bought a Christmas turkey. If she told you how much she paid for it and how many pounds it weighed, how would you find how much the turkey cost a pound?
4. Tom is saving his money to buy a radio. If you know how much the radio costs and how much Tom has already saved, what would you do to find how much more Tom has to save before he can buy the radio?
5. If Joan knows how many feet there are in a yard, what must she do to find how many feet there are in several yards?
6. If you know how much money a man has in the bank and how much more he puts in, how can you find how much he has in the bank then?
7. On an automobile trip, Mr. Graves knew how many miles he drove and how many gallons of gasoline he used. What would he do to find how many miles his automobile travelled on each gallon of gasoline?
8. If you know how old a father and son are, how can you find how much older the father is than his son?
9. If you know how many cans of beans are to be packed in cartons and how many cans a carton will hold, what would you do to find how many cartons are needed?

ESTIMATING THE ANSWER

Sometimes, in doing arithmetic, we get an answer that is *unreasonable* or not *sensible*. To avoid getting an unreasonable answer we should *estimate* the answer before we do the work. When we estimate an answer, we find out *about what the answer should be*. Then we do the work and compare the answer we get with the estimated answer. Then we know if our answer is reasonable. To make sure the answer is *correct* check the work.

Mrs. Sears paid \$23.60 for 4 dining-room chairs. What did each chair cost?

How to estimate the answer.

\$23.60 is about the same as \$24.

So each chair cost about $\$24 \div 4 = \$6$.

We see that the answer, \$5.90, is about the same as the estimated answer, \$6, so the answer is *reasonable*.

To make sure the answer is correct, check the work.

The work

\$ 5.90

4) \$23.60

Estimate the answer first. Be sure it is reasonable.

1. How much will a 6 lb. chicken cost at \$.48 a pound?

2. Sam had saved \$47.75. He paid \$24.98 for a suit. How much did Sam have left?

3. Roy paid \$6.90 for a pair of shoes; \$.95 for a tie; \$4.10 for a shirt; and \$3.85 for a pair of gloves. How much did these things cost him?

4. If 9 yd. of curtain material cost \$26.55, how much would 1 yd. cost?

Which of the answers shown for each exercise below is reasonable?

5. $7 \times 495 =$

2900? 3500? 4100?

6. $\$98.80 - \$29.90 =$

\$70? \$50? \$60?

7. $8 \overline{) \$238.40} =$

\$35? \$25? \$30?

8. $6 \overline{) \$4.92} =$

\$.70? \$.80? \$8.00?

GETTING THE CORRECT ANSWERS TO PROBLEMS

If you follow the steps below they will help you to get the correct answer to a problem.

1. **Understand the Problem.** Get a picture in your mind of what the problem says.
2. **What Does the Problem Tell Me?**
3. **What Does the Problem Ask Me to Find?**
4. **What Numbers Must I Work With?**
5. **What Must I Do with the Numbers?**
6. **Estimate the Answer.**
7. **Do the Work.**
8. **Is the Answer Reasonable?**
9. **Check the Work.**

Problems

1. David's mother sent him to the store for groceries. He paid 13¢ for a loaf of bread; 68¢ for lamb chops; 52¢ for a dozen eggs; and 38¢ for a peck of potatoes. How much did David pay the grocer?

2. Mrs. Burt bought a 7 lb. roast for Sunday dinner. If the roast cost \$.49 a pound, how much did she pay for her roast?

3. Elsie's mother paid \$1.47 for 3 pairs of children's wool socks. How much did each pair cost?

4. Alice needed a new dress. The clerk at the store showed her one dress which was priced \$8.00 and another priced \$6.95. What was the difference in the prices of the dresses?

5. On his way home from work yesterday, Mr. Lee bought 5 lb. of salmon. If he paid \$2.85 for it, how much a pound did the salmon cost?

6. Roy's father is a painter. Last week he worked 48 hours and earned \$1.25 an hour. How much did Roy's father earn last week?

GETTING THE CORRECT ANSWERS TO PROBLEMS

7. The pupils of Arthur School had a fine time at their school picnic at Shady Glen. It cost \$22.50 for buses; \$3.00 for the use of the grounds; \$37.49 for food; and \$5.25 for pop. How much were the total expenses?

8. Mr. Rover is a railroad conductor. Last week he made 4 regular trips and travelled 900 miles altogether. How many miles did he travel on each trip?

9. When the Grant family left on their vacation last summer, the reading on the speedometer of their automobile was 9847 miles. When they got home again, the speedometer read 11214 miles. How many miles did they travel during their vacation?

10. If an airplane travels at the rate of 185 mi. an hour, how far will it go in 12 hr?

11. Mr. Cabot was having his house painted. He paid \$58.05 for 9 gallons of paint. How much a gallon did the paint cost?

12. The town of Eden elected a new mayor recently. Mr. Roberts got 4673 votes; Mr. Quirk, 3989 votes; Mr. Steeves, 2764 votes; and Mr. Benson, 2578 votes. How many people voted in the election?

13. The Axe Manufacturing Company sold \$44,625 worth of axes last year. Their total expenses for the year amounted to \$39,780. How much was left as profit?

14. Mr. Foster, the principal, ordered 25 new books for the school library. If the books cost \$1.35 each, how much did the new books cost?

15. An automobile dealer sold 8 new Credo sedan automobiles for \$16,360. How much did he charge for each automobile?

16. Bill's father makes \$5.85 a day. If he worked 304 days last year, how much did he earn during the year.

DIVIDING BY A 2-FIGURE NUMBER ENDING In 0, 1, 2, 3, 4, or 5

The total cost of an excursion trip of the Outdoor Club was \$174.40. If the cost was divided evenly among the 32 members of the club, how much did each pay?

To find how much each paid we *divide* \$174.40 by 32.

1. *Divide.* The first partial dividend is 174. The divisor 32 ends in 2. To find 32's in 174, Think, "3's in 17 are 5".

Write the 5 over the 4, the last figure of the partial dividend.

2. *Multiply.* $5 \times 32 = 160$.

3. *Compare.* The product must not be larger than the partial dividend.

4. *Subtract.* $174 - 160 = 14$.

5. *Compare.* The remainder must be less than the divisor.

6. *Bring down* the 4 and place it under the 4 and next to the 14. The *second partial dividend* is 144.

7. **REMEMBER** that when a figure is taken down from the dividend a figure must be placed above it in the quotient.

Follow steps 1 to 7 again to find 32's in 144.

The third partial dividend is 160.

Follow steps 1 to 5 again to find 32's in 160.

So each member paid \$5.45.

	\$5.45
32)	\$174.40
	<u>160</u>
	144
	<u>128</u>
	160
	<u>160</u>

Check:

\$5.45
<u>32</u>
1090
<u>1635</u>
\$174.40

Rule: When a two-figure divisor ends in 0, 1, 2, 3, 4, or 5, find the trial quotient figure by finding how many times the first figure of the divisor is contained in the first or the first two figures of the dividend or partial dividend.

**DIVIDING BY A 2-FIGURE NUMBER ENDING
IN 0, 1, 2, 3, 4, or 5**

Divide. Check each answer.

1. $30 \overline{)690}$ $40 \overline{)857}$ $21 \overline{)882}$ $53 \overline{)596}$ $72 \overline{)792}$
2. $50 \overline{)2264}$ $70 \overline{)3956}$ $22 \overline{)1364}$ $61 \overline{)2593}$
3. $34 \overline{)1768}$ $83 \overline{)4653}$ $43 \overline{)2280}$ $52 \overline{)3848}$
4. $71 \overline{)6615}$ $63 \overline{)5859}$ $35 \overline{)1482}$ $94 \overline{)7726}$
5. $53 \overline{)4982}$ $82 \overline{)6897}$ $44 \overline{)3180}$ $73 \overline{)2555}$
6. $32 \overline{)14880}$ $71 \overline{)54264}$ $85 \overline{)27450}$ $54 \overline{)19178}$
7. $43 \overline{)27724}$ $62 \overline{)45570}$ $74 \overline{)47582}$ $95 \overline{)59187}$
8. $52 \overline{)29813}$ $33 \overline{)17391}$ $65 \overline{)15942}$ $84 \overline{)78798}$
9. $93 \overline{)\$689.13}$ $42 \overline{)\$195.30}$ $71 \overline{)\$379.85}$ $53 \overline{)\$340.79}$
10. $62 \overline{)\$339.76}$ $85 \overline{)\$461.55}$ $33 \overline{)\$140.58}$ $74 \overline{)\$698.56}$

11. Last fall Neil's father set out 636 strawberry plants. If he planted 53 plants to a row, how many rows did he have?

12. A Toronto mail carrier worked 42 weeks last year. During this time he walked 2268 miles on his route. How many miles a week did he walk?

13. Mr. Timmins has a chicken farm. He sells his eggs by the crate with 72 eggs to a crate. How many crates did he use last week to ship 3240 eggs?

14. Smith Bros. took in \$1056 at their sale of men's suits. If they sold 33 suits, what was the average price they received for the suits?

ROMAN NUMERALS

The Romans, who lived a long time ago, used letters to stand for numbers. They used 7 letters: I, V, X, L, C, D, and M. These are called Roman Numerals.

The values of the Roman numerals are shown below:

I	V	X	L	C	D	M
1	5	10	50	100	500	1000

When reading or writing Roman numerals, remember these rules:

1. *When a letter is repeated add its value to get the number.* XXX = 30; CC = 200; MMMM = 4000

2. *When a letter of smaller value is written after a letter of larger value add the two values.* XIII = 13; CL = 150

3. *When a letter of smaller value is written before a letter of larger value subtract the two values.* IV = 4; XL = 40; CM = 900

Exercises

1. Read these Roman numerals: IX, XIV, XXVI, XXXII, LXI, LXXV, CCXIX, CLVIII, DCX, CDXLI, MCDXI, MMMDCIV.

2. Write in Roman numerals; 17, 35, 59, 94, 256, 837, 1072, 1492, 1951.

3. Read these sentences:

- What time is it when both hands of a clock point to XII?
- Please bring me Volume XXV of "The History of the World".
- Chapter XLIV is the last chapter in the book.
- The corner stone of the post office was laid in MCMXLIX.

4. Write in Roman numerals the year of your birth.

DIVIDING BY A 2-FIGURE NUMBER ENDING IN 6, 7, 8, or 9

How many boxes are needed to pack 1753 cans of apple-juice if each box holds 48 cans, and how many cans will be left over?

To find how many boxes are needed we *divide* 1753 by 48.

$$\begin{array}{r}
 36R25 \\
 48 \overline{)1753} \\
 \underline{144} \\
 313 \\
 \underline{288} \\
 25
 \end{array}$$

Check:

$$\begin{array}{r}
 48 \\
 36 \\
 \hline
 288 \\
 144 \\
 \hline
 1728 \\
 +25 \\
 \hline
 1753
 \end{array}$$

1. *Divide.* The first partial dividend is 175. The divisor 48 is nearer 50 than it is to 40; so to find 48's in 175, increase the 4 by 1 to 5 and Think, "5's in 17 are 3". Write the 3 above the 5, the last figure of the partial dividend.

2. *Multiply.* $3 \times 48 = 144$.

3. *Compare.* The product must not be larger than the partial dividend.

4. *Subtract.* $175 - 144 = 31$.

5. *Compare.* The remainder must be less than the divisor.

6. *Bring down* the 3 and place it under the 3 and next to the 31. The second partial dividend is 313.

7. REMEMBER.

Follow steps 1 to 5 again to find 48's in 313.

So 36 boxes are needed and there will be 25 cans left over.

Rule: When a two-figure divisor ends in 6, 7, 8 or 9 increase the first figure of the divisor by 1. Find the trial quotient figure by finding how many times this figure is contained in the first or the first two figures of the dividend or partial dividend.

**DIVIDING BY A 2-FIGURE NUMBER ENDING
IN 6, 7, 8, or 9**

Divide. Check each answer.

- | | | | |
|----------------------------|------------------------|------------------------|------------------------|
| 1. $28 \overline{)803}$ | $37 \overline{)831}$ | $19 \overline{)684}$ | $26 \overline{)901}$ |
| 2. $18 \overline{)700}$ | $47 \overline{)601}$ | $39 \overline{)912}$ | $57 \overline{)815}$ |
| 3. $69 \overline{)3746}$ | $78 \overline{)2931}$ | $87 \overline{)4632}$ | $96 \overline{)4201}$ |
| 4. $29 \overline{)1382}$ | $48 \overline{)3576}$ | $79 \overline{)6804}$ | $58 \overline{)3790}$ |
| 5. $37 \overline{)1352}$ | $68 \overline{)5817}$ | $57 \overline{)2642}$ | $89 \overline{)7391}$ |
| 6. $76 \overline{)3302}$ | $49 \overline{)1774}$ | $28 \overline{)2400}$ | $86 \overline{)5464}$ |
| 7. $58 \overline{)43871}$ | $37 \overline{)25856}$ | $69 \overline{)44315}$ | $48 \overline{)21917}$ |
| 8. $19 \overline{)11320}$ | $66 \overline{)35824}$ | $87 \overline{)45515}$ | $59 \overline{)39928}$ |
| 9. $38 \overline{)24612}$ | $18 \overline{)10225}$ | $77 \overline{)56703}$ | $48 \overline{)30501}$ |
| 10. $87 \overline{)63205}$ | $69 \overline{)43826}$ | $39 \overline{)29850}$ | $57 \overline{)42502}$ |

11. There are 29 pupils in Johnstown School. The teacher had 155 tickets printed for the school concert. If each pupil took the same number of tickets to sell, how many tickets did each pupil take and how many tickets were left over?

12. There were 288 sandwiches for the 67 boys at the Boy Scouts' picnic. How many sandwiches did each boy get, if each got the same number, and how many sandwiches were left over?

13. Tom worked in a lobster canning factory last summer. His job was to pack the cans of lobster in boxes. If each box held 48 cans, how many boxes did Tom pack from 1752 cans and how many cans were left over?

MEASURES OF WEIGHT

To measure *how heavy* anything is we *weigh* it.

The common measures or units of weight are shown below. Note the abbreviations.

$$\begin{array}{l} 16 \text{ ounces (oz.)} = 1 \text{ pound (lb.)} \\ 2000 \text{ pounds (lb.)} = 1 \text{ ton (T.)} \end{array}$$

1. Name 10 things weighed by the pound.
2. Name 5 things bought by the ounce.
3. Name 3 things weighed by the ton.
4. How many pounds do you weigh?
5. Carrot seeds are bought by the ounce. How many ounces are there in a 15 lb. bag of carrot seeds?
6. Some railroad box cars can carry 30 tons. How many pounds can they carry?
7. Many things bought in packages or cans, have their *net weight* printed on the container. Net weight means the *weight of the contents* of the package or can. Ella picked up a package of pepper, with "net weight, 4 oz." printed on the package. What did that mean?
8. Jim's father bought a 2-ton truck. This does not mean that the truck weighed 2 tons. What does it mean?

On page 24 you learned that vegetables and grains are measured by the peck and bushel. Today, however, it is more common to measure vegetables and grains by the pound although the prices of these are usually given in bushels.

9. Mr. Weir sold 75 bu. of oats to a chicken farm. If a bushel of oats weighs 34 pounds, how many pounds did he sell?

10. Mr. Jackson sold 5820 lb. of potatoes to a co-operative. If a bushel of potatoes weighs 60 lb., how many bushels of potatoes did he sell?

BE SURE THE QUOTIENT FIGURE IS CORRECT

In most cases, the rules you learned on pages 37 and 40 will give the correct quotient figure on the first trial. However, there are many cases in which these rules do not work. So, actually, the quotient figure you use first is only a *trial quotient figure*. Study the examples below.

Divide 162 by 34

1. *Divide.* Think, "3's in 16 are 5, so 34's in 162 are 5".

2. *Multiply.* $5 \times 34 = 170$.

3. *Compare.* The product must not be larger than the dividend.

But 170 is larger than 162, so the quotient figure 5 is too large.

Try the next smaller figure, 4, as the trial quotient figure. It works.

Always compare the product with the dividend or partial dividend. If the quotient figure is too large try the next smaller figure. If it doesn't work, try the next smaller figure, etc.

Too large

$$\begin{array}{r} 5 \leftarrow \\ 34 \overline{)162} \\ \underline{170} \end{array} \begin{array}{l} \\ \\ \text{WRONG} \end{array}$$

Correct

$$\begin{array}{r} 4 \\ 34 \overline{)162} \\ \underline{136} \\ 26 \end{array}$$

Divide 339 by 48

1. *Divide.* Think, "5's in 33 are 6, so 48's in 339 are 6".

2. *Multiply.* $6 \times 48 = 288$.

3. *Compare.* It looks correct.

4. *Subtract.* $339 - 288 = 51$.

5. *Compare.* The remainder must be less than the divisor. But the remainder 51 is larger than the divisor, 48. Hence 48's in 339 are more than 6.

Try the next higher figure, 7, as the trial quotient figure. It works.

Always compare the remainder with the divisor. If the quotient figure is too small, try the next higher figure. If it doesn't work, try the next higher figure, etc.

Too small

$$\begin{array}{r} 6 \leftarrow \\ 48 \overline{)339} \\ \underline{288} \\ 51 \end{array} \begin{array}{l} \\ \\ \text{WRONG} \end{array}$$

Correct

$$\begin{array}{r} 7 \\ 48 \overline{)339} \\ \underline{336} \\ 3 \end{array}$$

BE SURE THE QUOTIENT FIGURE IS CORRECT

Divide. Check each answer.

- | | | | |
|--------------------------|----------------------|----------------------|----------------------|
| 1. $25\overline{)725}$ | $34\overline{)612}$ | $28\overline{)868}$ | $17\overline{)952}$ |
| 2. $44\overline{)811}$ | $15\overline{)802}$ | $27\overline{)837}$ | $16\overline{)870}$ |
| 3. $28\overline{)1176}$ | $57\overline{)3591}$ | $23\overline{)1564}$ | $75\overline{)6495}$ |
| 4. $16\overline{)1328}$ | $12\overline{)8928}$ | $44\overline{)4385}$ | $63\overline{)6162}$ |
| 5. $35\overline{)2602}$ | $77\overline{)6391}$ | $15\overline{)1095}$ | $57\overline{)5244}$ |
| 6. $13\overline{)1131}$ | $36\overline{)1548}$ | $27\overline{)1755}$ | $84\overline{)6451}$ |
| 7. $68\overline{)6256}$ | $14\overline{)5950}$ | $93\overline{)9145}$ | $46\overline{)1932}$ |
| 8. $54\overline{)3692}$ | $63\overline{)2443}$ | $94\overline{)5524}$ | $37\overline{)2775}$ |
| 9. $18\overline{)7999}$ | $74\overline{)7230}$ | $43\overline{)2196}$ | $66\overline{)4752}$ |
| 10. $83\overline{)5623}$ | $15\overline{)7980}$ | $48\overline{)4464}$ | $19\overline{)8267}$ |

11. Mr. Green says that his car averages 18 mi. to a gallon of gasoline. How many gallons of gasoline would he use on a trip of 612 miles?

12. Mary's brother worked 26 weeks for a construction company and earned \$702. How much did he earn each week?

13. If there are 24 bottles of pop in a case, how many cases are needed for 1104 bottles?

14. A Canadian Pacific Airlines plane flew from Vancouver to Hong Kong, a distance of 6930 mi. in 18 hr. How many miles an hour did the plane average?

ZERO IN THE QUOTIENT

Watch for zeros in the quotient!

You can't go wrong if you *put the first quotient figure directly over the last figure of the partial dividend and REMEMBER that when a figure is brought down from the dividend a figure must be placed above it in the quotient.*

ZERO AT THE END OF THE QUOTIENT		
Tell how each of these examples is done.	$45 \overline{)5852}$	$34 \overline{)176800}$
	$\underline{45}$	$\underline{170}$
	$\underline{135}$	$\underline{68}$
	$\underline{135}$	$\underline{68}$
	$\underline{2}$	$\underline{00}$

1. $24 \overline{)480}$ $37 \overline{)1110}$ $19 \overline{)1143}$ $65 \overline{)4582}$

2. $43 \overline{)9890}$ $56 \overline{)9541}$ $74 \overline{)25160}$ $18 \overline{)11169}$

3. $25 \overline{)\$67.50}$ $79 \overline{)\$252.80}$ $54 \overline{)\$345.60}$ $32 \overline{)\$1792.00}$

ZERO IN THE MIDST OF THE QUOTIENT		
Tell how each of these examples is done.	$62 \overline{)19096}$	$26 \overline{)53834}$
	$\underline{186}$	$\underline{52}$
	$\underline{496}$	$\underline{183}$
	$\underline{496}$	$\underline{182}$
		$\underline{14}$

4. $12 \overline{)4836}$ $35 \overline{)3745}$ $54 \overline{)11139}$ $48 \overline{)14499}$

5. $38 \overline{)15542}$ $63 \overline{)31898}$ $17 \overline{)13642}$ $76 \overline{)46132}$

6. $23 \overline{)46920}$ $15 \overline{)60761}$ $68 \overline{)\$727.60}$ $55 \overline{)\$599.50}$

PROBLEMS WITH TWO OR MORE STEPS

There are two or more steps in each of these problems. Find the answer to *each hidden question* and use the answer or answers to find the answer the problem asks.

1. Mrs. Robin had \$1.57 in her purse. She bought 2 doz. eggs at \$.48 a dozen. How much money did she have left?

Hint: How much did she pay for the eggs? Now, what would you do to find how much she had left?

2. Sam's father was going on a trip. He bought 3 shirts at \$2.50 each and a tie for \$1.25. How much did he pay the clerk?

3. Dorothy's mother made 210 sandwiches for the church picnic. She packed 185 of them in a basket and divided the rest evenly among her 5 children. How many sandwiches did each child get?

4. Mr. James is a potato farmer. One day he sold 1800 lb. of potatoes at \$1.35 a bu. How much did he get for the potatoes if there are 60 lb. in a bushel of potatoes?

5. Mrs. Tweed bought 3 lb. of round steak at \$.49 a pound, and 2 lb. of cod fillets at \$.28 a pound. How much change did she get from a \$5.00 bill?

6. Leo's father earns \$.75 an hour at the saw-mill. Yesterday he worked 8 hr. and today he worked 6 hr. How much did he earn in the two days?

7. Mrs. Nichols bought a radio for \$38 and an electric iron for \$14. She paid \$17 down and paid the rest in 5 equal weekly payments. How much did she pay each week?

8. Roy Davis earns \$28 a week. He pays his mother \$11 a week for board and he keeps \$5 a week for pocket money. Roy puts the rest of his money in the bank. How much will he save in 12 weeks?

WORKING WITH AVERAGES

To find the average of two or more numbers, first add the numbers and then divide the sum by the number of numbers added.

1. Norman sells newspapers. On Monday, he sold 37 papers; on Tuesday, 42 papers; on Wednesday, 46 papers; and on Thursday, 39 papers. What was the average number of papers he sold each day?

2. On his examinations Jim made these marks: English, 81; geography, 73; arithmetic, 92; science, 69; history, 75. What was Jim's average mark?

3. There were 7 boys on Central School hockey team. Their weights were: 88 lb; 93 lb.; 99 lb.; 106 lb.; 89 lb.; 116 lb.; and 95 lb. What was the average weight of the boys on the hockey team?

4. Mrs. Smith's electric light bill for Jan. was \$4.60; for Feb, \$4.30; for Mar., \$3.90; for April, \$3.70; for May, \$3.57; and for June, \$3.15. What was the average bill for the 6 months?

5. Mrs. Fraser paid \$36.20 for groceries in June; \$38.40 in July; and \$39.04 in August. What was the average bill for groceries for the 3 months?

6. There were 228 pupils in Brown St. School. If there were 6 classes, what was the average number of pupils in each class? (*Hint: You know the total; find the average.*)

7. Farmer Lipton shipped 24 hogs to the market. If the total weight of the hogs was 4152 lb., what was the average weight of the hogs?

8. On an automobile trip, Mr. Campbell drove an average of 283 mi. a day for 9 days. How many miles did he drive on his trip? (*Hint: You know the average; find the total.*)

KEEPING THE TOOLS SHARP

Add Check each exercise.

1.	1302	8446	4161	5925	2858
	9797	7108	4056	7307	5566
	6064	6085	6339	4314	9703
	5550	3244	2462	8920	2620
	8978	5166	9044	6209	3892
	<u>9032</u>	<u>4012</u>	<u>4250</u>	<u>9317</u>	<u>8540</u>
2.	\$49.81	\$ 2.07	\$35.45	\$ 6.04	\$35.94
	6.48	67.25	8.74	69.17	66.53
	37.55	18.83	2.08	56.20	8.07
	73.09	1.07	77.93	3.02	6.30
	4.06	48.11	40.30	1.16	52.28
	<u>26.51</u>	<u>33.62</u>	<u>2.52</u>	<u>24.30</u>	<u>41.80</u>

Subtract. Check each exercise.

3.	97148	51737	61762	56432	84326
	<u>74503</u>	<u>39644</u>	<u>18477</u>	<u>16534</u>	<u>78737</u>
4.	61520	75020	84000	61185	71012
	<u>37364</u>	<u>26245</u>	<u>77816</u>	<u>33884</u>	<u>15139</u>
5.	80207	94060	70234	54528	18095
	<u>34400</u>	<u>76008</u>	<u>54707</u>	<u>17431</u>	<u>14417</u>
6.	97290	47522	68431	22464	41952
	<u>62363</u>	<u>38936</u>	<u>39632</u>	<u>16996</u>	<u>12092</u>
7.	45719	72835	25237	73030	94111
	<u>36120</u>	<u>59545</u>	<u>16458</u>	<u>49462</u>	<u>66823</u>
8.	96070	25084	59323	93547	68262
	<u>85408</u>	<u>23629</u>	<u>29825</u>	<u>78749</u>	<u>47773</u>

DIVIDING BY A 3-FIGURE NUMBER

A farmers' co-operative sold 325 turkeys at Thanksgiving and received \$2047.50 for them. What was the average price received for the turkeys?

To find the average price received we *divide* \$2047.50 by 325.

	\$6.30
325)	\$2047.50
	1950
	975
	975
	0

Look at the divisor 325. The second figure of the divisor is not more than 5, so think of 325 as if it were 32.

1. *Divide.* Think, "3's in 20 are 6". Write the 6 over the 7, *the last figure of the partial dividend.*

2. *Multiply.* $6 \times 325 = 1950$.

3. *Compare.*

4. *Subtract.* $2047 - 1950 = 97$.

5. *Compare.*

6. Bring down the 5.

7. REMEMBER.

The second partial dividend is 975.

1. *Divide.* 2. *Multiply.* 3. *Compare.* 4. *Subtract.* 5. *Compare.* 6. Bring down the 0. 7. REMEMBER.

Think, "3's in 0 are 0". Write the 0 in the quotient as shown.

So the average price received for the turkeys was \$6.30.

Rule: When the second figure of a three-figure divisor is 0, 1, 2, 3, 4, or 5, find the trial quotient figure by finding how many times the first figure of the divisor is contained in the first or the first two figures of the dividend or partial dividend.

DIVIDING BY A 3-FIGURE NUMBER

Divide.

Check each answer.

- | | | | |
|-----------------------------|--------------------------|--------------------------|--------------------------|
| 1. $225 \overline{)9675}$ | 346 $\overline{)7266}$ | 108 $\overline{)8996}$ | 237 $\overline{)8058}$ |
| 2. $527 \overline{)33201}$ | 415 $\overline{)10797}$ | 631 $\overline{)46694}$ | 723 $\overline{)61525}$ |
| 3. $339 \overline{)18327}$ | 817 $\overline{)45862}$ | 442 $\overline{)30056}$ | 245 $\overline{)23275}$ |
| 4. $931 \overline{)43878}$ | 748 $\overline{)20948}$ | 536 $\overline{)15874}$ | 845 $\overline{)41387}$ |
| 5. $326 \overline{)69438}$ | 235 $\overline{)76140}$ | 516 $\overline{)71309}$ | 437 $\overline{)85421}$ |
| 6. $623 \overline{)261660}$ | 835 $\overline{)317356}$ | 752 $\overline{)345920}$ | 547 $\overline{)432572}$ |
| 7. $413 \overline{)85078}$ | 348 $\overline{)141636}$ | 935 $\overline{)285198}$ | 652 $\overline{)523674}$ |
| 8. $738 \overline{)218235}$ | 446 $\overline{)156514}$ | 529 $\overline{)98988}$ | 336 $\overline{)169344}$ |
| 9. $632 \overline{)79143}$ | 917 $\overline{)385617}$ | 123 $\overline{)51926}$ | 429 $\overline{)278061}$ |
| 10. $536 \overline{)87254}$ | 328 $\overline{)174162}$ | 237 $\overline{)156049}$ | 825 $\overline{)392600}$ |

11. An air-liner which travels at the rate of 225 miles an hour made a non-stop flight of 3825 miles. How many hours did it take to make the flight?

12. How many crates are needed to ship 11718 oranges if each crate holds 217 oranges?

13. Tom Johns got a job picking potatoes last fall for Mr. Stevens. He picked 135 barrels of potatoes and was paid \$20.25. How much did Tom get for each barrel he picked?

14. A drug firm sells bottles of "Cure-All" pills to drug stores. If each bottle holds 144 pills, how many bottles does the drug firm fill with 9360 pills?

15. A shipment of 315 dressed hogs weighed 51975 lb. What was the average weight of the dressed hogs?



THE CLASS CHRISTMAS TREE

Christmas is a happy time for everyone. People exchange presents and cards with greetings of good cheer. The boys and girls in Grade VI had a Christmas party in their school room. Here are some of the things they did.

1. The boys got a tree in the woods and made a stand for it. To decorate the tree they bought 3 strings of Christmas lights at \$1.85 each; 3 packages of tinsel at \$.25 a package; 2 dozen bells at 5¢ each; and a star for \$.29. How much did they pay for the decorations?

2. The girls' job was to fill a stocking for each pupil. They bought 6 lb. of candy at \$.40 a pound; 3 lb. of nuts at \$.35 a pound; 3 dozen oranges at \$.45 a dozen; and 5 lb. of raisins at \$.27 a pound. How much did the girls pay for these things?

3. How much did the boys and the girls spend altogether? (Hint: Add answers of questions 1 and 2.)

4. There were 34 pupils in the Grade VI class. If each pupil gave \$.15 for a Christmas present for the teacher, how much did the whole class give?

5. The teacher gave the children an ice-cream treat. If she paid \$3.06 for the ice-cream for the 34 pupils, how much did the ice-cream for each pupil cost?

6. If the total cost of the Christmas party was \$19.04, how much would each of the 34 pupils have to pay if each paid the same amount?

DIVIDING BY A 3-FIGURE NUMBER

McNights Ladies' Store sold \$91486 worth of goods last year. If the store was open 298 days during the year, what was the average amount taken in daily?

To find the average amount taken in daily we *divide* \$91486 by 298.

Look at the divisor 298. The second figure of the divisor is more than 5, so think of the 2 as if it were a 3.

1. *Divide.* The first partial dividend is 914. Think, "3's in 9 are 3".

Write the 3 in the quotient over the 4, the last figure of the partial dividend.

2. *Multiply.* $3 \times 298 = 894$.

3. *Compare.*

4. *Subtract.* $914 - 894 = 20$.

5. *Compare.*

6. Bring down the 8.

7. REMEMBER.

The second partial dividend is 208.

1. *Divide.* 298 is not contained in 208. Write 0 in the quotient over the 8. Bring down the 6.

The third partial dividend is 2086.

1. *Divide.* Think, "3's in 20 are 6".

2. *Multiply.* $6 \times 298 = 1788$.

3. *Compare.*

4. *Subtract.* $2086 - 1788 = 298$.

5. *Compare.* The remainder is not less than the divisor. The quotient figure 6 is too small. Try 7. It works. The average amount taken in daily was \$307.

	\$ 307
298	) \$91486
	894
	2086
	2086

Rule: When the second figure of a divisor is 6, 7, 8 or 9, increase the first figure by 1. Find the trial quotient figure by finding how many times this figure is contained in the first or the first two figures of the dividend or partial dividend.

DIVIDING BY A 3-FIGURE NUMBER

Divide. Check each answer.

- | | | | |
|------------------------------|--------------------------|--------------------------|----------------------------|
| + 1. $286 \overline{)6852}$ | 391 $\overline{)9975}$ | 473 $\overline{)8243}$ | 583 $\overline{)7764}$ |
| ✓ 2. $374 \overline{)20353}$ | 685 $\overline{)32195}$ | 792 $\overline{)51540}$ | 881 $\overline{)64313}$ ✓ |
| 3. $591 \overline{)22458}$ | 498 $\overline{)41886}$ | 387 $\overline{)25155}$ | 666 $\overline{)31502}$ |
| 4. $273 \overline{)14196}$ | 872 $\overline{)50576}$ | 586 $\overline{)22984}$ | 493 $\overline{)37468}$ ✓ |
| 5. $395 \overline{)53395}$ | 284 $\overline{)92118}$ | 188 $\overline{)43992}$ | 692 $\overline{)87192}$ |
| 6. $794 \overline{)420820}$ | 195 $\overline{)130740}$ | 479 $\overline{)134182}$ | 895 $\overline{)322257}$ ✓ |
| 7. $392 \overline{)80460}$ | 568 $\overline{)60412}$ | 285 $\overline{)30495}$ | 496 $\overline{)101795}$ |
| 8. $683 \overline{)223341}$ | 476 $\overline{)352701}$ | 885 $\overline{)547955}$ | 186 $\overline{)37944}$ ✓ |

9. A barrel of flour weighs 196 pounds. How many barrels are there in a shipment of 8428 pounds of flour? ✓

10. During the Christmas rush a post-office sent out 32936 pieces of mail. If it was sent in 184 bags what was the average number of pieces in each bag? ✓

11. Mr. Kent worked 294 days last year. If his income for the year was \$1528.80, how much a day did he earn? ✓

12. Bob's father owns a large chicken farm. Last week he sold 385 chickens and received \$704.55 for them. What was the average price received for each chicken? ✓

13. Roy Robson is an automobile dealer. Last week he and his salesmen sold 137 automobiles and took in \$267,150. What was the average price received for each automobile? ✓

DIVIDING WHEN DIVISOR AND DIVIDEND END IN ZERO

Last spring Mr. Todd tapped 700 maple trees and collected 4200 gallons of sap. On the average, how many gallons did he collect from each tree?

To find how many gallons he collected from each tree we divide 4200 by 700.

Cross out the *same number of zeros at the end of both the divisor and dividend.*

Then divide. 7's in 42 are 6.

So Mr. Todd collected an average of 6 gal. from each tree.

$$\begin{array}{r} 6 \\ 7\cancel{0}\cancel{0}\overline{)42\cancel{0}\cancel{0}} \end{array}$$

Tell how these
are done



$$\begin{array}{r} 7 \\ 4\cancel{0}\overline{)28\cancel{0}} \end{array}$$

$$\begin{array}{r} 20 \\ 32\cancel{0}\overline{)640\cancel{0}} \\ \underline{64} \\ 0 \end{array}$$

Divide. First, cross out the same number of zeros at the end of both the divisor and dividend.

$$1. \quad 20\overline{)80} \quad 30\overline{)90} \quad 50\overline{)350} \quad 80\overline{)720} \quad 60\overline{)480}$$

$$2. \quad 300\overline{)600} \quad 400\overline{)1600} \quad 900\overline{)4500} \quad 700\overline{)6300}$$

$$3. \quad 120\overline{)960} \quad 340\overline{)1360} \quad 670\overline{)3350} \quad 530\overline{)3710}$$

$$4. \quad 260\overline{)1300} \quad 140\overline{)2800} \quad 310\overline{)9300} \quad 750\overline{)3000}$$

5. Mr. Tobin, the grocer, sold 420 lb. of potatoes yesterday. If there are 60 lb. in a bushel of potatoes, how many bushels did he sell?

6. How many bundles of paper are there if 4500 sheets of paper are packed with 500 sheets in each bundle?

7. If apples are packed in boxes with 260 apples to a box, how many boxes are needed for 6240 apples?

8. Jean's father earns \$150 a month. How many months does it take him to earn \$3000?



VERONICA'S DREAM

Veronica is in Grade VI. Last night she had a wonderful dream about a long trip to a big city, and of the many wonderful things she saw there.

1. Veronica dreamt she went to the station and paid \$255.50 for a railway ticket. She paid \$33.75 for a sleeping berth, and \$16.90 for meals on the train. How much did she spend before she got to the big city?

2. In the city she went to a hotel which had 428 rooms. Someone told her that it cost \$1150 to build each room of the hotel. How much did it cost to build the hotel?

3. One afternoon Veronica and some friends she met went on a sight-seeing tour of the city. If it cost \$52.80 for the sight-seeing bus and there were 32 people on the tour, how much did the tour cost each person?

4. One evening she went to a large theatre in the city. There were 35 rows of seats and there were 62 seats in each row. How many seats were there altogether?

5. Veronica dreamt she came home by plane. If the distance to her home was 1575 mi. and the plane travelled 225 mi. an hour, how long did it take her to get home?

6. When she got off the plane she took a taxi to her own house. The taxi fare was \$1.35. How much change did she get if she paid her fare with a \$10-bill?

DIAGNOSTIC TEST IN DIVISION

The work below will test you on the kinds of division you should know. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown on the right.

ONE-FIGURE DIVISOR			Page	
1.	$8\overline{)46792}$	$6\overline{)54872}$	$7\overline{)26694}$	28
ZERO IN THE QUOTIENT				
2.	$4\overline{)15624}$	$9\overline{)35732}$	$8\overline{)40325}$	29
TWO-FIGURE DIVISOR ENDING IN 0, 1, 2, 3, 4, OR 5				
3.	$63\overline{)15561}$	$84\overline{)45630}$	$75\overline{)47782}$	38
TWO-FIGURE DIVISOR ENDING IN 6, 7, 8 OR 9				
4.	$58\overline{)33447}$	$29\overline{)13735}$	$46\overline{)26110}$	41
BE SURE THE QUOTIENT FIGURE IS CORRECT				
5.	$24\overline{)8496}$	$18\overline{)11792}$	$14\overline{)10290}$	44
ZERO IN THE QUOTIENT				
6.	$37\overline{)10360}$	$83\overline{)42013}$	$25\overline{)52250}$	45
THREE-FIGURE DIVISOR WITH SECOND FIGURE 0, 1, 2, 3, 4, OR 5				
7.	$537\overline{)33931}$	$238\overline{)17625}$	$146\overline{)11680}$	50
THREE-FIGURE DIVISOR WITH SECOND FIGURE 6, 7, 8, OR 9				
8.	$485\overline{)22310}$	$672\overline{)206304}$	$791\overline{)229514}$	53
DIVISOR AND DIVIDEND ENDING IN ZERO				
9.	$800\overline{)4800}$	$130\overline{)5200}$	$490\overline{)24500}$	54

MEASURES OF TIME

To measure time we must have measures or units of time. Since measurement means comparison, *a measure or unit must be a certain space of time.*

The common measures or units of time are shown below. Note the abbreviations.

60 seconds (sec.)	=	1 minute (min.)
60 minutes (min.)	=	1 hour (hr.)
24 hours (hr.)	=	1 day (da.)
7 days (da.)	=	1 week (wk.)
52 weeks (wk.)	=	1 year (yr.)
365 days (da.)	=	1 year
366 days (da.)	=	1 leap year
10 years (yr.)	=	1 decade
100 years (yr.)	=	1 century

1. How many seconds in an hour? Hours in a week?
2. Over 4 centuries ago, an explorer named Magellan sailed around the world in 1083 days. About how many years did it take him?
3. What is meant by: 10.25 a.m. 4.10 p.m.
4. Cora's father works from 8.00 a.m. until 5.00 p.m. each day with 1 hr. out for lunch. How many hours a day does he work?
5. A year number into which 4 divides evenly is a leap year. Which of these years were leap years? 1846; 1892; 1904; 1934; 1944.
6. An even century year is not a leap year unless 400 will divide evenly into the number of the year. Was 1900 a leap year? Will the year 2000 be a leap year?
7. Ask your teacher to teach you a rhyme that will help you to remember how many days there are in each month of the year.

COUNTING THINGS

Two common units used by business men in ordering certain kinds of goods in large quantities are the *dozen* and the *gross*. Usually, things ordered by these units are small in size and are in general use by the public.

Memorize this table. Note the abbreviations.

12 things	= 1 dozen (doz.)
12 dozen (doz.)	= 1 gross (gro.)
144 things	= 1 gross (gro.)

Book and stationery stores buy such things as pen nibs, pencils, erasers, rulers, Christmas cards, etc. by the gross. Dry goods stores buy needles, spools of thread, buttons, etc. by the gross. Drug stores buy patent medicines, tooth-brushes, soap, etc. by the gross.

1. The day school opened, Black's Bookstore sold 13 doz. pencils. How many pencils were sold?

2. On the same day they sold 108 erasers. How many dozen erasers were sold?

3. A druggist ordered 5 gross of Canary Liniment. How many bottles of liniment did he order?

4. Mr. Greenwell gave a traveller an order for 14 gro. of buttons. How many buttons did he order?

5. A manufacturer had 864 knitting needles in stock. How many gross of needles did he have?

6. A factory turned out 3312 tooth-brushes in one day. How many gross of tooth-brushes was that?

7. Peter's father is a commercial traveller. He got an order yesterday for 7 dozen fountain pens; 6 gross of lead pencils; 8 dozen erasers; and 3 gross of rulers. How many of each were ordered?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	4659	3136	6995	2376	2868
	7109	5864	2307	7558	6297
	3641	8547	6634	6414	7950
	7297	6499	5489	2069	4475
	5025	4037	9927	8334	5720
	<u>1872</u>	<u>3318</u>	<u>2894</u>	<u>8781</u>	<u>5741</u>

2.	\$42.85	\$17.69	\$59.57	\$40.77	\$59.38
	28.29	68.04	25.65	78.47	35.09
	66.32	71.52	12.50	58.84	93.96
	41.57	48.78	99.98	25.63	57.24
	38.23	59.02	23.34	31.49	72.80
	<u>17.74</u>	<u>15.56</u>	<u>88.46</u>	<u>40.10</u>	<u>39.36</u>

Subtract. Check each exercise.

3.	83173	96947	31490	22957	17063
	<u>51329</u>	<u>20385</u>	<u>20963</u>	<u>17773</u>	<u>14218</u>

4.	66614	71942	16550	17531	57211
	<u>63754</u>	<u>70970</u>	<u>15466</u>	<u>11679</u>	<u>48820</u>

5.	70102	40002	80600	90001	20000
	<u>39067</u>	<u>39524</u>	<u>40014</u>	<u>82848</u>	<u>10032</u>

6.	\$157.17	\$183.63	\$123.46	\$103.00	\$140.90
	<u>83.54</u>	<u>93.25</u>	<u>60.68</u>	<u>32.72</u>	<u>75.46</u>

7.	\$404.51	\$863.03	\$324.00	\$340.04	\$926.31
	<u>235.84</u>	<u>764.68</u>	<u>159.89</u>	<u>274.15</u>	<u>459.87</u>

8.	63711	47803	70030	\$137.96	\$353.00
	<u>39776</u>	<u>39054</u>	<u>41738</u>	<u>48.29</u>	<u>276.61</u>

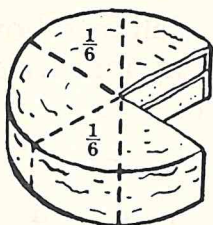
CANADA'S NEWEST PROVINCE

On April 1st, 1949, Newfoundland formally became the 10th province of Canada. Newfoundland is made up of the island of Newfoundland and part of Labrador. Newfoundland has great fishing, lumbering, and mining resources. May Canada and Newfoundland both profit by the union!



1. Newfoundland was discovered by John Cabot in 1497. How many years ago is that?
2. The capital of Newfoundland is the city of St. John's. In 1935 the population of St. John's was 39,886, while in 1945 its population was 44,603. By how many did the population of this city increase from 1935 to 1945?
3. Next to St. John's, the seven places with the largest populations in 1945 were: Bell Island, 8171; Bishop's Falls, 2522; Botwood, 2744; Carbonear, 3472; Corner Brook, 8711; Grand Falls, 4552; and Windsor, 2772. What was the total population of these places in 1945?
4. The population of Canada, before Newfoundland became a province was 12,883,000. When Newfoundland entered Confederation, her population was 321,819. What was Canada's population then?
5. In 1919, Alcock and Brown, two R.A.F. officers made the first non-stop flight across the Atlantic. They flew from Newfoundland to Ireland, a distance of 1920 miles in 16 hours. How many miles an hour did they average?

THE MEANING OF A FRACTION



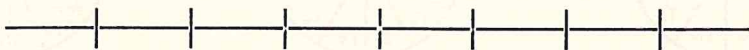
The cake on the left is cut into 6 *equal* parts. Each of the parts is *one sixth* of the cake. One-sixth is written in figures as $\frac{1}{6}$. You will notice that $\frac{1}{6}$ of the cake is gone and *five-sixths* are left. Five-sixths is written in figures as $\frac{5}{6}$.

Quantities like $\frac{1}{6}$ and $\frac{5}{6}$ are called *fractions*.

A fraction is one or more of the equal parts into which a whole (a single thing or a unit) is divided.

A fraction like $\frac{5}{6}$ tells two things. (1) The figure below the line, 6, called the *denominator*, tells into how many equal parts the whole is divided. (2) The figure above the line, 5, called the *numerator*, tells how many of the equal parts are taken or are talked about. The numerator and the denominator of a fraction are called the *terms* of the fraction.

A fraction like $\frac{3}{10}$ in which the numerator is smaller than the denominator is called a *proper fraction*.



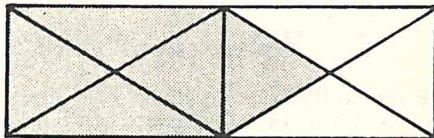
1. Into how many parts is the line above divided?
2. What do you notice about the size of the parts?
3. What is each part called? 3 parts? 7 parts?

What do you mean by each of the following:

4. $\frac{3}{4}$ of an apple?
5. $\frac{2}{5}$ of a chocolate bar?
6. $\frac{1}{10}$ of a pencil?
7. $\frac{7}{16}$ of a pumpkin?

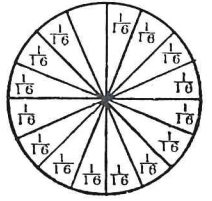
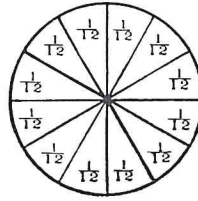
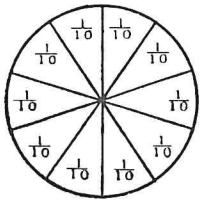
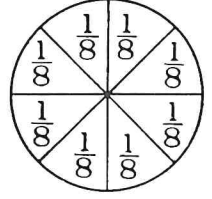
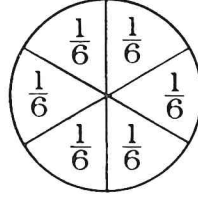
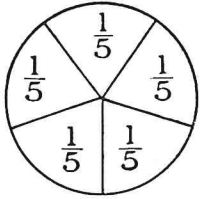
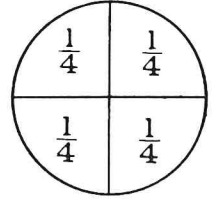
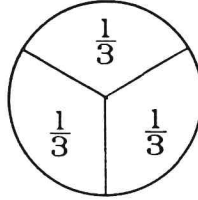
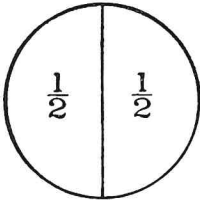
8. Name the numerator and the denominator of each of these fractions: $\frac{1}{2}$, $\frac{3}{5}$, $\frac{4}{7}$, $\frac{3}{10}$, $\frac{5}{12}$, $\frac{11}{16}$

9. What part of the figure on the right is shaded? What part is not shaded? What are the terms of each of these fractions?



COMPARING FRACTIONS

All the circles below are the same size. Tell into how many equal parts each circle is divided and say and write the name of each and of several equal parts.



1. Which is the larger: $\frac{1}{2}$ or $\frac{1}{3}$? $\frac{1}{2}$ or $\frac{2}{3}$?
2. Which is the larger: $\frac{1}{3}$ or $\frac{1}{4}$? $\frac{1}{3}$ or $\frac{2}{4}$? $\frac{2}{3}$ or $\frac{3}{4}$?
3. Which is the smaller: $\frac{1}{4}$ or $\frac{1}{5}$? $\frac{1}{2}$ or $\frac{2}{5}$? $\frac{2}{3}$ or $\frac{4}{5}$?
4. Which is smaller: $\frac{1}{6}$ or $\frac{1}{5}$? $\frac{3}{5}$ or $\frac{3}{6}$? $\frac{5}{6}$ or $\frac{4}{5}$?
5. Which is larger: $\frac{1}{8}$ or $\frac{1}{6}$? $\frac{5}{8}$ or $\frac{4}{5}$? $\frac{7}{8}$ or $\frac{5}{6}$?
6. Which is larger: $\frac{1}{10}$ or $\frac{1}{8}$? $\frac{7}{10}$ or $\frac{3}{4}$? $\frac{9}{10}$ or $\frac{7}{8}$?
7. Which is smaller: $\frac{1}{12}$ or $\frac{1}{10}$? $\frac{7}{16}$ or $\frac{3}{4}$? $\frac{5}{12}$ or $\frac{3}{8}$?

Hint to Teacher. Have cardboard circles about 1 foot in diameter divided into the number of parts shown above with the name of each part printed on it. Separate the parts. Have pupils answer the questions above by superimposing the parts.

FRACTIONAL PARTS OF AN INCH

Part of a foot measure, like the one you own, is shown below. Each inch on the foot measure is divided into halves, fourths, eighths, and sixteenths.



1. Which lines on the foot measure mark off the whole inches?

2. Which lines mark off the $\frac{1}{2}$ inches? the $\frac{1}{4}$'s? the $\frac{1}{8}$ ths? the $\frac{1}{16}$ ths?

3. How many $\frac{1}{8}$ inches in 1 in.? How many $\frac{1}{16}$ inches in 1 in.?

4. Which is longer: $\frac{1}{2}$ in. or $\frac{5}{8}$ in.? $\frac{1}{4}$ in. or $\frac{3}{16}$ in.?

5. Which is longer: $\frac{3}{8}$ in. or $\frac{5}{16}$ in.? $\frac{3}{4}$ in. or $\frac{7}{16}$ in.?

6. $\frac{1}{2}$ in. = how many eighths of an inch?

7. $\frac{3}{4}$ in. = how many eighths of an inch?

8. $\frac{1}{4}$ in. = how many sixteenths of an inch?

9. Use your foot measure to measure the line below.

If you measured the line correctly you found that it is $3\frac{1}{4}$ in. long. This means it is 3 whole inches long and $\frac{1}{4}$ of another inch. $3\frac{1}{4}$ is read, "three and one-fourth".

A number like $3\frac{1}{4}$ is called a *mixed number* because it is made up of whole number (3) and a fraction ($\frac{1}{4}$).

10. How long are the lines below:

11. Bobby's puppy weighs $8\frac{1}{2}$ lb. What does that mean?

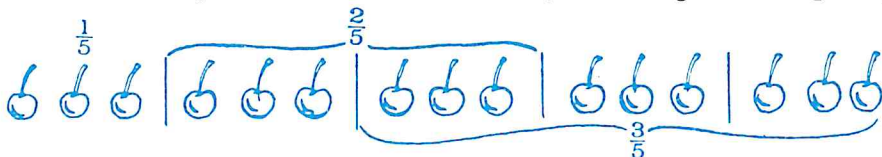
12. Tell what each of these mixed numbers means:
 $4\frac{5}{8}$ in.; $2\frac{3}{4}$ qt.; $7\frac{5}{16}$ lb.; $5\frac{1}{4}$ hr.; $13\frac{3}{8}$ gal.; $20\frac{1}{2}$ T.

THE MEANING OF A FRACTION

On page 61 we divided a whole which was a single thing or a unit into equal parts. One or more of the equal parts was a fraction of the whole.

A *group* of things may be *divided into equal parts* also. One or more of the equal parts of the group will be a fraction of the group.

Below you see 15 cherries. This group of cherries is divided into 5 *equal* parts. There are 3 cherries (the same number) in each part. Each part is $\frac{1}{5}$ of the group. Two parts is $\frac{2}{5}$ of the group, and 3 parts is $\frac{3}{5}$ of the group.



A fraction is one or more of the equal parts into which a group is divided.

Look at the 15 cherries above again. You see that $\frac{1}{5}$ of 15 is 3. But you know that $15 \div 5 = 3$. So,

To find $\frac{1}{5}$ of a number divide the number by 5.

1. Count out a group of 12 books. Divide the group into 3 equal parts. How many books are there in each part? What is a short way to find $\frac{1}{3}$ of 12?

2. What is a short way to find $\frac{1}{6}$ of a number? $\frac{1}{8}$ of a number? $\frac{1}{10}$ of a number? $\frac{1}{16}$ of a number?

Find: 3. $\frac{1}{2}$ of 24 $\frac{1}{4}$ of 16 $\frac{1}{6}$ of 36

4. $\frac{1}{8}$ of 96 $\frac{1}{12}$ of 84 $\frac{1}{20}$ of 180

5. Neil caught 21 trout last Saturday. He gave $\frac{1}{7}$ of them to Roy. How many trout did he give to Roy?

6. Ellen liked to pick sea shells. If she picked 45 sea shells and gave $\frac{1}{9}$ of them to her teacher, how many sea shells did she give to her teacher?

FINDING FRACTIONAL PARTS OF NUMBERS

Joan's mother was going to make a fruit salad. She sent Joan to the store for $\frac{3}{4}$ doz. oranges. How many oranges did Joan get?



Above you see a dozen or 12 oranges. The group of 12 oranges is divided into 4 equal parts. Joan got $\frac{3}{4}$ dozen which you find by counting is 9 oranges. So $\frac{3}{4}$ of 12 is 9.

Here is a short way to find $\frac{3}{4}$ of 12.

Find $\frac{1}{4}$ of 12, which is 3.

Then $\frac{3}{4}$ of 12 is $3 \times 3 = 9$.

Rule: To find a fractional part of a number do 2 things:

(1) Divide the number by the denominator of the fraction, and

(2) Multiply the answer by the numerator of the fraction.

Find the answer:

1. $\frac{2}{5}$ of 20 $\frac{2}{3}$ of 15 $\frac{3}{8}$ of 56 $\frac{3}{4}$ of 32

2. $\frac{5}{6}$ of 54 $\frac{5}{8}$ of 80 $\frac{7}{10}$ of 40 $\frac{4}{7}$ of 63

3. $\frac{7}{8}$ of 128 $\frac{5}{12}$ of 144 $\frac{3}{16}$ of 96 $\frac{11}{20}$ of 220

4. $\frac{3}{4}$ of 52 dresses $\frac{7}{8}$ of 72 automobiles

5. $\frac{5}{6}$ of 48 inches $\frac{9}{10}$ of 220 yards

6. If a pound of sausages costs 48¢, how much will $\frac{5}{8}$ of a pound cost?

7. If buns are 24¢ a dozen, how much will $\frac{3}{4}$ of a dozen cost?

8. How many inches in $\frac{2}{3}$ of a yard?

9. How many minutes in $\frac{3}{5}$ of an hour? in $\frac{7}{12}$ of an hour?

10. How many months in $\frac{3}{4}$ of a year? in $\frac{2}{3}$ of a year?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1. $\times$	7505	9362	8525	368	3949
	7289	7847	9887	3445	8337
	2423	9475	1744	6963	601
	4598	2710	7193	7080	787
	9304	4382	7936	201	3955
	3087	7166	8829	756	3736

Subtract. Check each exercise.

2. $\times$	13609	12437	14761	16500	18080
	9275	8019	9477	7474	8952
3. $\times$	95173	61645	85680	25348	17082
	43957	38164	81921	16252	14463
4. $\times$	72753	93258	65270	52405	72357
	53974	89269	55974	44679	68589

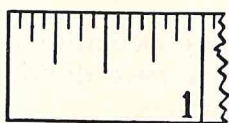
Multiply. Check each exercise.

5.	2475	3896	1679	4768	2754
	6	8	7	9	8
6.	97	83	58	189	802
	60	46	75	28	92
7.	567	681	294	935	592
	154	387	400	690	207

Divide. Check each exercise.

8. $\times$	$37 \overline{)15651}$	$73 \overline{)45893}$	$15 \overline{)10980}$	$64 \overline{)62573}$
9. $\times$	$42 \overline{)19740}$	$85 \overline{)31463}$	$54 \overline{)11124}$	$38 \overline{)26835}$
10. $+$	$129 \overline{)47364}$	$582 \overline{)69305}$	$436 \overline{)221488}$	

CHANGING A FRACTION TO LOWEST TERMS



The inch on the left is divided into halves, fourths, eighths, and sixteenths.

Notice that, $\frac{8}{16} = \frac{4}{8} = \frac{2}{4} = \frac{1}{2}$

These fractions have the *same value* but their *terms* are *different*.

Notice that, $\frac{8 \div 2}{16 \div 2} = \frac{4}{8}$ $\frac{8 \div 4}{16 \div 4} = \frac{2}{4}$ $\frac{8 \div 8}{16 \div 8} = \frac{1}{2}$

Remember this rule: If we divide both the numerator and the denominator of a fraction by the same number, the value of the fraction does not change; the only things that change are the terms of the fraction.

When $\frac{8}{16}$ was changed to $\frac{4}{8}$ or $\frac{2}{4}$ it was changed to *lower* terms.

When $\frac{8}{16}$ was changed to $\frac{1}{2}$ it was changed to *lowest* terms.

A fraction is in its lowest terms when both the numerator and the denominator cannot be divided evenly by any number except 1.

HOW TO CHANGE A FRACTION TO LOWEST TERMS

Change $\frac{16}{20}$ to lowest terms.

Find the largest number that will divide evenly into both the numerator and the denominator, and divide both the numerator and the denominator by that number.

4 is the largest number that will divide evenly into both 16 and 20.

Think, $\frac{16}{20} = \frac{16 \div 4}{20 \div 4} = \frac{4}{5}$

Write, $\frac{16}{20} = \frac{4}{5}$

Change these fractions to lowest terms:

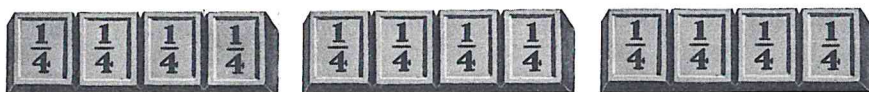
1. $\frac{2}{4}$ $\frac{2}{6}$ $\frac{6}{8}$ $\frac{4}{10}$ $\frac{10}{12}$ $\frac{12}{16}$ $\frac{8}{20}$ $\frac{9}{15}$
2. $\frac{16}{24}$ $\frac{12}{32}$ $\frac{6}{18}$ $\frac{24}{36}$ $\frac{18}{48}$ $\frac{40}{50}$ $\frac{25}{100}$ $\frac{48}{144}$

3. Roy changed $\frac{20}{24}$ to $\frac{10}{12}$. Did he change $\frac{20}{24}$ to lowest terms?

4. What part of a year is 8 months? Express in lowest terms.

A FRACTION IS ONE WAY OF SHOWING DIVISION

Four boys, Tom, Leo, Jim, and Fred had 3 chocolate bars among them. Below you see how the 3 bars were divided among the 4 boys so that each got the same share.



Each of the 4 boys got $\frac{3}{4}$ of a chocolate bar.

We see that "3 bars" were divided by 4. So $3 \div 4 = \frac{3}{4}$

The fraction $\frac{3}{4}$ is a way of showing that 3 is divided by 4.

Write the following as fractions. Each answer must be in lowest terms.

1. $2 \div 4$ $4 \div 5$ $3 \div 9$ $8 \div 12$

2. $6 \div 14$ $5 \div 12$ $10 \div 16$ $4 \div 10$

3. $12 \div 24$ $15 \div 20$ $24 \div 30$ $20 \div 36$

4. The teacher had a piece of ribbon 2 yd. long. If she divided the ribbon evenly among 5 girls, how long a piece would each girl get?

5. Mrs. Thompson served 3 bricks of ice-cream to the 12 people at her party. How much ice-cream did each person get?

6. Draw a line 4 ft. long on the blackboard and divide it into 6 equal parts. How long should each part be? Measure each part to see if you are correct.

7. On an overnight hike the Boy Scouts decided to sleep for 5 hours with one boy at a time staying awake and on guard. If there were 10 boys on the hike, how long should each boy be on guard?

8. Mr. Todd paid 8 boys a total of \$6 for helping him pick potatoes. What part of a dollar did each boy get if each got the same amount? How many cents did each boy get?

ADDING WHEN THE FRACTIONS HAVE THE SAME NAME

A fraction takes its name from its denominator. The name of $\frac{5}{8}$ is *eighths*. Fractions which have the *same name* have the *same or a common denominator*. $\frac{1}{6}$ and $\frac{5}{6}$ have the same name. Such fractions are called *like fractions*.

Rule: Only fractions with the same name can be added.

Harry's father caught 3 large trout last Saturday. The trout weighed $1\frac{3}{16}$ lb.; $2\frac{5}{16}$ lb.; and $2\frac{4}{16}$ lb. How much did the trout weigh altogether?

To find how much the trout weighed altogether we *add*.

$$1\frac{3}{16}$$

$$2\frac{5}{16}$$

$$2\frac{4}{16}$$

$$\hline 5\frac{12}{16} = 5\frac{3}{4}$$

The fractions have the same name.

Add the fractions first. $\frac{3}{16} + \frac{5}{16} + \frac{4}{16} = \frac{12}{16}$

Then add the whole numbers. $1 + 2 + 2 = 5$

Change $\frac{12}{16}$ to lowest terms. $\frac{12}{16} = \frac{3}{4}$

The 3 trout weighed $5\frac{3}{4}$ lb.

Rule: To add fractions with the same name add the numerator of the fractions and write the sum over the common denominator of the fractions.

Add. Each answer must be in lowest terms.

$$1. \quad \frac{1}{4} \quad \frac{2}{5} \quad \frac{3}{8} \quad \frac{1}{10} \quad \frac{3}{7} \quad \frac{5}{12} \quad \frac{7}{16}$$

$$\frac{1}{4} \quad \frac{1}{5} \quad \frac{1}{8} \quad \frac{7}{10} \quad \frac{2}{7} \quad \frac{3}{12} \quad \frac{3}{16}$$

$$2. \quad 2\frac{1}{6} \quad 4\frac{1}{8} \quad 6\frac{4}{9} \quad 5\frac{1}{12} \quad 7\frac{3}{10} \quad 9\frac{5}{16}$$

$$3\frac{1}{6} \quad 2\frac{5}{8} \quad 3\frac{2}{9} \quad 8\frac{7}{12} \quad 2\frac{3}{10} \quad 4\frac{1}{16}$$

$$3. \quad 1\frac{1}{5} \quad 2\frac{3}{8} \quad 5\frac{3}{10} \quad 6\frac{5}{16} \quad 3\frac{1}{12} \quad 4\frac{7}{20}$$

$$3\frac{2}{5} \quad 4\frac{1}{8} \quad 1\frac{4}{10} \quad 2\frac{1}{16} \quad 5\frac{5}{12} \quad 6\frac{3}{20}$$

$$2\frac{1}{5} \quad 3\frac{2}{8} \quad 4\frac{1}{10} \quad 3\frac{3}{16} \quad 7\frac{4}{12} \quad 2\frac{9}{20}$$

4. Elsie had two pieces of ribbon. One piece was $4\frac{1}{12}$ ft. long and the other, $3\frac{5}{12}$ ft. How many feet of ribbon did Elsie have altogether?

SUBTRACTING WHEN THE FRACTIONS HAVE THE SAME NAME

Rule: Only fractions with the same name can be subtracted.

Yesterday, Jack and Fred helped their father pick the potatoes in their field. Jack picked $13\frac{3}{4}$ bu. and Fred picked $9\frac{1}{4}$ bu. How many more bushels did Jack pick than Fred?

To find how many more bushels Jack picked we *subtract* $9\frac{1}{4}$ from $13\frac{3}{4}$

The fractions have the same name.

Subtract the fractions first. $\frac{3}{4} - \frac{1}{4} = \frac{2}{4}$

Then subtract the whole numbers.

$$13 - 9 = 4$$

Change $\frac{2}{4}$ to lowest terms. $\frac{2}{4} = \frac{1}{2}$

So Jack picked $4\frac{1}{2}$ bu. more than Fred.

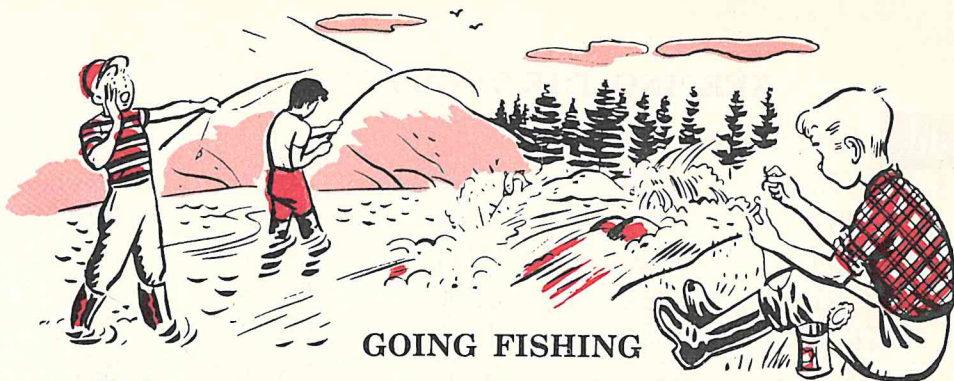
$$\begin{array}{r} 13\frac{3}{4} \\ - 9\frac{1}{4} \\ \hline 4\frac{2}{4} = 4\frac{1}{2} \end{array}$$

Rule: To subtract fractions with the same name subtract the numerators of the fractions and write the difference over the common denominator of the fractions.

Subtract. Each answer must be in lowest terms.

- | | | | | | | |
|---|--|--|--|---|---|--|
| 1. $\frac{2}{3}$
$\frac{1}{3}$
<hr/> | $\frac{4}{5}$
$\frac{2}{5}$
<hr/> | $\frac{7}{8}$
$\frac{3}{8}$
<hr/> | $\frac{5}{6}$
$\frac{1}{6}$
<hr/> | $\frac{9}{10}$
$\frac{3}{10}$
<hr/> | $\frac{7}{12}$
$\frac{5}{12}$
<hr/> | $\frac{11}{16}$
$\frac{7}{16}$
<hr/> |
| 2. $5\frac{4}{5}$
$3\frac{1}{5}$
<hr/> | $6\frac{5}{8}$
$2\frac{1}{8}$
<hr/> | $9\frac{6}{7}$
$4\frac{4}{7}$
<hr/> | $11\frac{7}{10}$
$5\frac{3}{10}$
<hr/> | $8\frac{5}{16}$
$2\frac{3}{16}$
<hr/> | $13\frac{8}{9}$
$6\frac{5}{9}$
<hr/> | |
| 3. $10\frac{7}{8}$
$4\frac{5}{8}$
<hr/> | $12\frac{9}{10}$
$7\frac{1}{10}$
<hr/> | $14\frac{15}{16}$
$9\frac{11}{16}$
<hr/> | $16\frac{3}{5}$
$11\frac{1}{5}$
<hr/> | $15\frac{5}{7}$
$8\frac{2}{7}$
<hr/> | $9\frac{11}{12}$
$2\frac{5}{12}$
<hr/> | |
| 4. $7\frac{13}{16}$
$4\frac{7}{16}$
<hr/> | $18\frac{7}{12}$
$9\frac{1}{12}$
<hr/> | $23\frac{5}{9}$
$18\frac{4}{9}$
<hr/> | $32\frac{7}{8}$
$25\frac{1}{8}$
<hr/> | $24\frac{9}{10}$
$17\frac{7}{10}$
<hr/> | $45\frac{3}{16}$
$29\frac{1}{16}$
<hr/> | |

5. Rita travelled $8\frac{5}{8}$ hr. by boat and train to get to her grandmother's. If she was on the train $6\frac{1}{8}$ hr., how long did she travel by boat?



GOING FISHING

Fishing is a sport that all boys and men enjoy. Part of the fun is the getting out into the open. The clear air and the sunshine makes one feel healthy and strong.

1. Ted was anxious to go on a fishing trip with his pals, Leo and Fred. But Ted had no fishing gear. So his father bought him a fishing rod for \$4.75; a fishing line for \$.65; and a pair of rubber boots for \$5.25. How much did these things cost Ted's father?

2. When the boys got to the lake, they pitched a tent 375 ft. from the shore. How many yards was their tent from the shore?

3. The first day, the trout that Ted caught weighed $3\frac{3}{8}$ lb.; Leo's weighed $4\frac{1}{8}$ lb.; and Fred's weighed $4\frac{3}{8}$ lb. How many pounds of trout did they catch altogether?

4. During the day the boys went on a hike. They came to an old church with MDCCCLII marked on the corner stone. In what year was the church built?

5. When the boys started on their trip they took $4\frac{3}{4}$ lb. of bacon with them. When they were ready for home, they had $1\frac{1}{4}$ lb. left. How many pounds did they eat?

6. The total expenses of the trip were \$10.95. If each paid the same amount, how much did it cost each boy?

7. On a trip of his own last week Ted's father caught 8 trout which weighed 96 oz. altogether. What was the average weight of the trout?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	8075	5949	6236	7645	2724
	3937	7604	8566	2832	8037
	1564	6226	3271	7337	6191
	8191	1394	5880	5296	2668
	7650	9832	4599	5013	7234
	<u>4324</u>	<u>3427</u>	<u>3437</u>	<u>2961</u>	<u>8529</u>

Subtract. Check each exercise.

2.	14428	15700	71519	27063	48565
	<u>9375</u>	<u>8642</u>	<u>21263</u>	<u>23544</u>	<u>14792</u>
3.	59537	32936	18124	55422	42306
	<u>56468</u>	<u>14982</u>	<u>17776</u>	<u>35659</u>	<u>33828</u>
4.	71851	46040	80503	72000	30000
	<u>44982</u>	<u>27306</u>	<u>30605</u>	<u>58013</u>	<u>28751</u>

Multiply. Check each exercise.

5.	3917	8130	2698	1074	3986
	<u>5</u>	<u>6</u>	<u>8</u>	<u>7</u>	<u>9</u>
6.	69	75	96	254	509
	<u>20</u>	<u>38</u>	<u>76</u>	<u>49</u>	<u>85</u>
7.	647	869	716	985	476
	<u>148</u>	<u>297</u>	<u>300</u>	<u>580</u>	<u>106</u>

Divide. Check each exercise.

8.	64) <u>34752</u>	39) <u>18223</u>	16) <u>10432</u>	55) <u>51865</u>
9.	73) <u>35040</u>	28) <u>26619</u>	46) <u>14122</u>	87) <u>35419</u>
10.	236) <u>36108</u>	493) <u>89726</u>	627) <u>317262</u>	

IMPROPER FRACTIONS

Fractions like $\frac{6}{6}$, $\frac{7}{2}$, and $\frac{11}{4}$ are *improper fractions*.

An improper fraction is one in which *the numerator is the same as or larger than the denominator*. Hence an improper fraction is equal to or greater than 1.



$\frac{6}{6}$ is an improper fraction



$\frac{7}{2}$ is an improper fraction

On the left you see $\frac{6}{6}$ of a chocolate bar. $\frac{6}{6}$ means "six-sixths". If the $\frac{6}{6}$ are fitted together, they make 1 whole chocolate bar. So $\frac{6}{6} = 1$.

On the left you see $\frac{7}{2}$ apples. $\frac{7}{2}$ means "seven-halves". If the $\frac{7}{2}$ are fitted together they make $3\frac{1}{2}$ apples. So $\frac{7}{2} = 3\frac{1}{2}$

CHANGING IMPROPER FRACTIONS TO WHOLE NUMBERS OR MIXED NUMBERS

Change $\frac{7}{2}$ to a mixed number.

From the illustration above we know that $\frac{7}{2} = 3\frac{1}{2}$.

However, we can change $\frac{7}{2}$ to a mixed number by the following rule:

To change an improper fraction to a whole number or to a mixed number divide the numerator by the denominator. If there is a remainder, write it as the numerator of a fraction with the same denominator as the denominator of the improper fraction. Write the fractional remainder in lowest terms.

The work $\Rightarrow \begin{array}{r} 3\frac{1}{2} \\ 2 \overline{)7} \end{array}$ Hence $\frac{7}{2} = 3\frac{1}{2}$

Change to whole numbers or mixed numbers:

1. $\frac{8}{8}$ $\frac{9}{2}$ $\frac{10}{4}$ $\frac{26}{8}$ $\frac{48}{12}$ $\frac{13}{5}$ $\frac{28}{6}$ $\frac{147}{6}$ $\frac{45}{9}$ $\frac{265}{10}$

Add. Each answer must be in lowest terms:

2. $\frac{1}{2}$ $\frac{3}{4}$ $\frac{5}{6}$ $\frac{3}{8}$ $\frac{7}{10}$ $\frac{5}{12}$ $\frac{3}{16}$ $\frac{7}{9}$
 $\frac{1}{2}$ $\frac{2}{4}$ $\frac{3}{6}$ $\frac{7}{8}$ $\frac{9}{10}$ $\frac{11}{12}$ $\frac{11}{16}$ $\frac{8}{9}$
 $\frac{1}{2}$ $\frac{1}{4}$ $\frac{1}{6}$ $\frac{5}{8}$ $\frac{3}{10}$ $\frac{9}{12}$ $\frac{15}{16}$ $\frac{6}{9}$

ADDING MIXED NUMBERS WITH CARRYING

In the mechanic science class Allan measured three boards very carefully. He found their lengths were $17\frac{5}{8}$ in.; $19\frac{7}{8}$ in.; and $21\frac{6}{8}$ in. Then he placed the boards end to end. How long were the three boards altogether?

To find how long the three boards were we add $17\frac{5}{8}$, $19\frac{7}{8}$, and $21\frac{6}{8}$.

Add the fractions. $\frac{5}{8} + \frac{7}{8} + \frac{6}{8} = \frac{18}{8}$

Change $\frac{18}{8}$ to $2\frac{2}{8}$

Write the $\frac{2}{8}$ under the fractions.

CARRY the whole number 2 and add to it the whole numbers 17, 19, and 21. Write the 59 under the whole numbers.

Change $\frac{2}{8}$ to lowest terms. $\frac{2}{8} = \frac{1}{4}$

So the three boards were $59\frac{1}{4}$ in. long altogether.

$$\begin{array}{r} 17\frac{5}{8} \\ 19\frac{7}{8} \\ 21\frac{6}{8} \\ \hline 59\frac{2}{8} = 59\frac{1}{4} \end{array}$$

Add and check.

Each answer must be in lowest terms.

- | | | | | | |
|---|---|---|--|--|---|
| 1. $4\frac{2}{3}$
<u>$5\frac{2}{3}$</u> | $7\frac{3}{4}$
<u>$3\frac{3}{4}$</u> | $2\frac{5}{8}$
<u>$6\frac{7}{8}$</u> | $9\frac{4}{7}$
<u>$4\frac{6}{7}$</u> | $1\frac{5}{6}$
<u>$5\frac{1}{6}$</u> | $8\frac{3}{10}$
<u>$6\frac{9}{10}$</u> |
| 2. $3\frac{7}{8}$
<u>$9\frac{7}{8}$</u> | $11\frac{3}{5}$
<u>$7\frac{4}{5}$</u> | $4\frac{1}{2}$
<u>$\frac{1}{2}$</u> | $\frac{11}{12}$
<u>$6\frac{5}{12}$</u> | $13\frac{7}{9}$
<u>$12\frac{5}{9}$</u> | $7\frac{11}{16}$
<u>$\frac{9}{16}$</u> |
| 3. $8\frac{2}{5}$
<u>$2\frac{4}{5}$</u> | $3\frac{8}{9}$
<u>$1\frac{4}{9}$</u> | $7\frac{3}{8}$
<u>$5\frac{7}{8}$</u> | $11\frac{7}{16}$
<u>$3\frac{15}{16}$</u> | $1\frac{6}{7}$
<u>$4\frac{5}{7}$</u> | $5\frac{7}{12}$
<u>$8\frac{11}{12}$</u> |
| 4. $8\frac{1}{2}$
<u>$3\frac{1}{2}$</u>
<u>$7\frac{1}{2}$</u> | $12\frac{2}{5}$
<u>$9\frac{4}{5}$</u>
<u>$6\frac{3}{5}$</u> | $19\frac{5}{6}$
<u>$25\frac{2}{6}$</u>
<u>$22\frac{5}{6}$</u> | $6\frac{9}{10}$
<u>$5\frac{3}{10}$</u>
<u>$\frac{9}{10}$</u> | $\frac{7}{12}$
<u>$17\frac{11}{12}$</u>
<u>$9\frac{5}{12}$</u> | $10\frac{11}{16}$
<u>$\frac{15}{16}$</u>
<u>$15\frac{13}{16}$</u> |

5. At the meat market last Saturday, Mrs. Gibbons bought $5\frac{3}{8}$ lb. of beef and $4\frac{7}{8}$ lb. of pork. How many pounds of meat did she buy altogether?

6. Last Saturday Bill took $1\frac{5}{12}$ hr. to mow the lawn and $1\frac{7}{12}$ hr. to trim the hedge. How long did he work?

SUBTRACTING A FRACTION OR A MIXED NUMBER FROM A WHOLE NUMBER

Jean's mother had 7 lb. of sugar in the pantry. She used $\frac{5}{8}$ lb. of sugar to make syrup. How many pounds of sugar did she have left?

$$\begin{array}{r} 7 = 6\frac{8}{8} \\ \frac{5}{8} = \frac{5}{8} \\ \hline 6\frac{3}{8} \end{array}$$

Tell how this is done
Subtract

$$\begin{array}{r} 12 = 11\frac{5}{5} \\ 3\frac{3}{5} = \frac{3}{5} \\ \hline 8\frac{2}{5} \end{array}$$

To find how many pounds she had left we *subtract* $\frac{5}{8}$ from 7.

There is no fraction above $\frac{5}{8}$ from which to subtract it. *Borrow* 1 whole from 7 and change the 1 whole to $\frac{8}{8}$.

So $7 = 6\frac{8}{8}$

Now subtract $\frac{5}{8}$ from $6\frac{8}{8}$

Subtract the fractions. $\frac{8}{8} - \frac{5}{8} = \frac{3}{8}$

Bring down the 6.

So she had $6\frac{3}{8}$ lb. of sugar left.

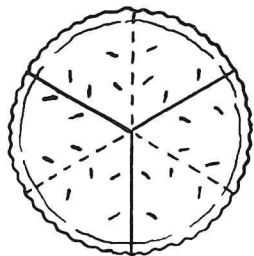
Subtract. Check each exercise.

- | | | | | | |
|--|---|---|--|---|---|
| 1. $\begin{array}{r} 5 \\ \frac{1}{4} \end{array}$ | 8 $\begin{array}{r} \frac{5}{6} \end{array}$ | 6 $\begin{array}{r} \frac{1}{2} \end{array}$ | 10 $\begin{array}{r} \frac{3}{7} \end{array}$ | 13 $\begin{array}{r} \frac{9}{10} \end{array}$ | 11 $\begin{array}{r} \frac{2}{3} \end{array}$ |
| 2. $\begin{array}{r} 9 \\ \frac{7}{8} \end{array}$ | 15 $\begin{array}{r} \frac{1}{12} \end{array}$ | 17 $\begin{array}{r} \frac{5}{16} \end{array}$ | 1 $\begin{array}{r} \frac{3}{10} \end{array}$ | 21 $\begin{array}{r} \frac{11}{20} \end{array}$ | 1 $\begin{array}{r} \frac{5}{12} \end{array}$ |
| 3. $\begin{array}{r} 4 \\ 2\frac{1}{2} \end{array}$ | 7 $\begin{array}{r} 3\frac{2}{3} \end{array}$ | 9 $\begin{array}{r} 6\frac{2}{5} \end{array}$ | 8 $\begin{array}{r} 4\frac{5}{9} \end{array}$ | 12 $\begin{array}{r} 9\frac{5}{6} \end{array}$ | 14 $\begin{array}{r} 6\frac{7}{10} \end{array}$ |
| 4. $\begin{array}{r} 13 \\ 5\frac{1}{4} \end{array}$ | 26 $\begin{array}{r} 15\frac{3}{8} \end{array}$ | 31 $\begin{array}{r} 17\frac{11}{12} \end{array}$ | 23 $\begin{array}{r} 18\frac{7}{16} \end{array}$ | 6 $\begin{array}{r} 5\frac{1}{3} \end{array}$ | 11 $\begin{array}{r} 10\frac{5}{8} \end{array}$ |

5. Sam's father was repairing the front steps. He cut a piece of board $6\frac{7}{12}$ ft. long from a board which was 11 ft. long. How much of the board was left?

CHANGING A FRACTION TO HIGHER TERMS

The pie on the right is divided into 6 equal parts. The heavy lines divide the pie into 3 equal parts. We see that $\frac{2}{3} = \frac{4}{6}$. These fractions have the *same value* or are the *same size*, but the *terms* of $\frac{4}{6}$ are *higher* than the terms of $\frac{2}{3}$.



Remember this rule: If we multiply both the numerator and the denominator of a fraction by the same number, the value of the fraction does not change; the only things that change are the terms of the fraction.

HOW TO CHANGE A FRACTION TO HIGHER TERMS

Change $\frac{3}{4}$ to sixteenths.

$$\frac{3}{4} = \frac{?}{16}$$

Think,

"4's in 16 are 4"

$$4 \times 3 = 12$$

$$\text{Write } \frac{3}{4} = \frac{12}{16}$$

To find the number by which the denominator 4 must be multiplied to give 16, think, "4's in 16 are 4". If the value of the fractions is to remain the same, we must multiply the numerator 3 by 4. Think, " $4 \times 3 = 12$ ". So $\frac{3}{4}$ has been changed to $\frac{12}{16}$.

Change each fraction below to higher terms with the denominator shown.

1. $\frac{1}{2} = \frac{\quad}{4}$

$\frac{1}{3} = \frac{\quad}{12}$

$\frac{1}{5} = \frac{\quad}{10}$

$\frac{1}{4} = \frac{\quad}{8}$

2. $\frac{2}{3} = \frac{\quad}{6}$

$\frac{3}{8} = \frac{\quad}{16}$

$\frac{3}{4} = \frac{\quad}{12}$

$\frac{5}{6} = \frac{\quad}{18}$

3. $\frac{3}{5} = \frac{\quad}{15}$

$\frac{1}{6} = \frac{\quad}{12}$

$\frac{1}{2} = \frac{\quad}{6}$

$\frac{7}{8} = \frac{\quad}{16}$

4. $\frac{3}{4} = \frac{\quad}{20}$

$\frac{4}{5} = \frac{\quad}{25}$

$\frac{5}{8} = \frac{\quad}{32}$

$\frac{3}{10} = \frac{\quad}{30}$

Fractions like $\frac{2}{3}$ and $\frac{5}{6}$ which have different denominators are called *unlike fractions*.

Before unlike fractions can be added or subtracted they must have the same common denominator. (same name)

Important. The common denominator of two or more unlike fractions is the largest denominator if the other denominators divide into it evenly.

ADDING UNLIKE FRACTIONS AND MIXED NUMBERS HAVING UNLIKE FRACTIONS

Susan, Charlie, and Dick spent the afternoon picking blueberries. Susan picked $2\frac{1}{2}$ gal.; Charlie, $1\frac{7}{8}$ gal.; and Dick, $2\frac{3}{4}$ gal. How many gallons of blueberries did they pick altogether?

To find how many gallons they picked we *add*.

$$\begin{array}{r} 2\frac{1}{2} = 2\frac{4}{8} \\ 1\frac{7}{8} = 1\frac{7}{8} \\ 2\frac{3}{4} = 2\frac{6}{8} \\ \hline 7\frac{1}{8} \end{array}$$

Before we can add $\frac{1}{2}$, $\frac{7}{8}$, and $\frac{3}{4}$, they must have the same name or *a common denominator*. Since the denominators 2 and 4 divide evenly into the denominator 8, 8 is the common denominator.

Change $\frac{1}{2}$ and $\frac{3}{4}$ to eighths. $\frac{1}{2} = \frac{4}{8}$ and $\frac{3}{4} = \frac{6}{8}$. Add the fractions $\frac{4}{8} + \frac{7}{8} + \frac{6}{8} = \frac{17}{8}$. Change $\frac{17}{8}$

to $2\frac{1}{8}$. Write the $\frac{1}{8}$ under the fractions.

CARRY the 2 and add it to the whole numbers. The sum is 7. Write the 7 under the whole number.

So they picked $7\frac{1}{8}$ gal. altogether.

Add. Each answer must be in lowest terms.

$$\begin{array}{r} 1. \quad \frac{1}{2} \quad \frac{2}{3} \quad \frac{1}{8} \quad \frac{3}{10} \quad \frac{8}{9} \quad \frac{5}{6} \quad \frac{3}{4} \quad \frac{7}{8} \\ \frac{1}{4} \quad \frac{1}{6} \quad \frac{3}{4} \quad \frac{3}{5} \quad \frac{2}{3} \quad \frac{11}{12} \quad \frac{5}{8} \quad \frac{3}{16} \end{array}$$

$$\begin{array}{r} 2. \quad 5\frac{1}{6} \quad 8\frac{3}{4} \quad 7\frac{1}{2} \quad 2\frac{3}{5} \quad 4\frac{5}{8} \quad 11\frac{7}{10} \\ 4\frac{1}{2} \quad 3\frac{1}{12} \quad 6\frac{5}{16} \quad 9\frac{1}{10} \quad 6\frac{5}{16} \quad 7\frac{3}{20} \end{array}$$

$$\begin{array}{r} 3. \quad 9\frac{3}{4} \quad 14\frac{2}{5} \quad 12\frac{7}{12} \quad 18\frac{1}{2} \quad 16\frac{7}{8} \quad 34\frac{4}{9} \\ 7\frac{1}{2} \quad 3\frac{9}{10} \quad 15\frac{5}{6} \quad 9\frac{7}{8} \quad 21\frac{11}{16} \quad 8\frac{2}{3} \end{array}$$

$$\begin{array}{r} 4. \quad 2\frac{1}{4} \quad 4\frac{3}{8} \quad 7\frac{2}{3} \quad 3\frac{1}{2} \quad 12\frac{3}{4} \quad 16\frac{2}{3} \\ 1\frac{1}{2} \quad 2\frac{1}{4} \quad 5\frac{5}{6} \quad 9\frac{4}{5} \quad \frac{5}{8} \quad 13\frac{5}{12} \\ 3\frac{1}{8} \quad 6\frac{3}{16} \quad 8\frac{1}{12} \quad 11\frac{3}{10} \quad 8\frac{7}{16} \quad \frac{1}{2} \end{array}$$

SUBTRACTING UNLIKE FRACTIONS AND MIXED NUMBERS HAVING UNLIKE FRACTIONS

Jack's father killed and dressed two lambs and sold them at the co-operative store. One lamb weighed $40\frac{1}{4}$ lb., and the other $37\frac{9}{16}$ lb. What was the difference in the weights of the lambs?

To find the difference in the weights we subtract $37\frac{9}{16}$ from $40\frac{1}{4}$.

Before we can subtract $\frac{9}{16}$ from $\frac{1}{4}$ they must have a *common denominator*.

Since the denominator 4 divides evenly into the denominator 16, 16 is the common denominator.

Change $\frac{1}{4}$ to sixteenths. $\frac{1}{4} = \frac{4}{16}$

We cannot subtract $\frac{9}{16}$ from $\frac{4}{16}$. Borrow 1 whole from 40 and change the 1 whole to $\frac{16}{16}$. Add the $\frac{16}{16}$ to $\frac{4}{16}$ making $\frac{20}{16}$. So $40\frac{4}{16} = 39\frac{20}{16}$.

Subtract. $\frac{20}{16} - \frac{9}{16} = \frac{11}{16}$ and $39 - 37 = 2$.

So the difference in the weights of the lambs is $2\frac{11}{16}$ lb.

$$\begin{array}{r} 40\frac{1}{4} = 40\frac{4}{16} = 39\frac{20}{16} \\ 37\frac{9}{16} = 37\frac{9}{16} = 37\frac{9}{16} \\ \hline 2\frac{11}{16} \end{array}$$

Subtract and check.

terms.

Each answer must be in lowest

- | | | | | | | | |
|--|---|--|--|--|---|---|---|
| 1. $\begin{array}{r} \frac{1}{2} \\ \frac{1}{4} \\ \hline \end{array}$ | $\begin{array}{r} \frac{1}{3} \\ \frac{1}{6} \\ \hline \end{array}$ | $\begin{array}{r} \frac{3}{4} \\ \frac{3}{8} \\ \hline \end{array}$ | $\begin{array}{r} \frac{5}{6} \\ \frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} \frac{9}{10} \\ \frac{2}{5} \\ \hline \end{array}$ | $\begin{array}{r} \frac{11}{12} \\ \frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} \frac{15}{16} \\ \frac{5}{8} \\ \hline \end{array}$ | $\begin{array}{r} \frac{7}{9} \\ \frac{2}{3} \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 7\frac{3}{4} \\ 4\frac{3}{16} \\ \hline \end{array}$ | $\begin{array}{r} 9\frac{1}{2} \\ 5\frac{5}{12} \\ \hline \end{array}$ | $\begin{array}{r} 12\frac{2}{3} \\ 6\frac{2}{9} \\ \hline \end{array}$ | $\begin{array}{r} 15\frac{11}{12} \\ 8\frac{1}{6} \\ \hline \end{array}$ | $\begin{array}{r} 17\frac{5}{8} \\ 9\frac{3}{16} \\ \hline \end{array}$ | $\begin{array}{r} 14\frac{1}{2} \\ 7\frac{5}{32} \\ \hline \end{array}$ | | |
| 3. $\begin{array}{r} 10\frac{1}{6} \\ 3\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 13\frac{1}{2} \\ 6\frac{3}{4} \\ \hline \end{array}$ | $\begin{array}{r} 18\frac{3}{10} \\ 9\frac{4}{5} \\ \hline \end{array}$ | $\begin{array}{r} 11\frac{2}{3} \\ 5\frac{8}{9} \\ \hline \end{array}$ | $\begin{array}{r} 16\frac{1}{4} \\ 7\frac{7}{8} \\ \hline \end{array}$ | $\begin{array}{r} 12\frac{1}{3} \\ 3\frac{7}{12} \\ \hline \end{array}$ | | |
| 4. $\begin{array}{r} 15\frac{3}{16} \\ 6\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 21\frac{1}{6} \\ 19\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 32\frac{5}{16} \\ 14\frac{7}{8} \\ \hline \end{array}$ | $\begin{array}{r} 28\frac{7}{12} \\ 7\frac{3}{4} \\ \hline \end{array}$ | $\begin{array}{r} 43\frac{3}{5} \\ 26\frac{7}{10} \\ \hline \end{array}$ | $\begin{array}{r} 25\frac{5}{6} \\ 9\frac{11}{12} \\ \hline \end{array}$ | | |
| 5. $\begin{array}{r} 17\frac{3}{10} \\ 8\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 19\frac{5}{12} \\ 9\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 25\frac{1}{4} \\ 13\frac{5}{16} \\ \hline \end{array}$ | $\begin{array}{r} 53\frac{1}{12} \\ 37\frac{5}{6} \\ \hline \end{array}$ | $\begin{array}{r} 36\frac{3}{20} \\ 15\frac{3}{4} \\ \hline \end{array}$ | $\begin{array}{r} 27\frac{1}{4} \\ 14\frac{17}{32} \\ \hline \end{array}$ | | |

PROBLEMS USING FRACTIONS

1. Mrs. Young made a lemon pie yesterday. She served $\frac{2}{3}$ of the pie at dinner and Tony ate $\frac{1}{6}$ of the pie after school. How much of the pie was gone then?

2. Everyday Tess walks $\frac{7}{8}$ mi. to school, while Elsie walks $\frac{1}{2}$ mi. to the same school. How much farther does Tess have to walk to school than Elsie?

3. Molly likes to help her mother in the kitchen. Yesterday they used $4\frac{1}{2}$ cups of sugar to make fudge and $1\frac{1}{4}$ cups of sugar to make cookies. How many cups of sugar did they use?

4. Jim is in Grade VI. He can jump $3\frac{1}{4}$ ft. in the high jump but his older brother can jump $4\frac{1}{2}$ ft. How much higher can his older brother jump?

5. Every Saturday Harry has work to do at home. Last Saturday he worked $\frac{1}{2}$ hr. cleaning the cellar, $\frac{5}{6}$ hr. mowing the lawn, and $\frac{2}{3}$ hr. sawing wood. How long did Harry work last Saturday?

6. Mary's mother had $5\frac{1}{2}$ yd. of lace. She used $1\frac{5}{8}$ yd. to trim a dress she was making for Mary. How many yards of lace did she have left?

7. Mrs. O'Toole hooked a mat which was $4\frac{1}{2}$ ft. long and $2\frac{1}{2}$ ft. wide. How much longer than wide was the mat?

8. Mr. Porter, the baker, made $12\frac{5}{12}$ doz. loaves of white bread in the morning and $7\frac{2}{3}$ doz. loaves of brown bread in the afternoon. How many loaves of bread did he make that day?

9. Sammy is $3\frac{7}{12}$ ft. tall. His father is $5\frac{1}{2}$ ft. tall. How much shorter is Sammy than his father?

10. Farmer Neal was repairing his fences. If he put a post $7\frac{1}{4}$ ft. long in a hole $3\frac{5}{12}$ ft. deep, how much of the post was above the ground?

PRACTICE IN ADDITION AND SUBTRACTING OF FRACTIONS

Add and check.

Each answer must be in lowest terms.

$$\begin{array}{r} 1. \quad \frac{2}{5} \\ \frac{2}{5} \\ \hline \end{array} \quad \frac{5}{8} \\ \frac{1}{8} \\ \hline \quad \frac{1}{10} \\ \frac{7}{10} \\ \hline \quad \frac{7}{16} \\ \frac{7}{16} \\ \hline \quad \frac{5}{6} \\ \frac{5}{6} \\ \hline \quad \frac{7}{12} \\ \frac{11}{12} \\ \hline \quad \frac{8}{9} \\ \frac{4}{9} \\ \hline \quad \frac{3}{7} \\ \frac{6}{7} \\ \hline$$

$$\begin{array}{r} 2. \quad \frac{1}{2} \\ \frac{1}{8} \\ \hline \end{array} \quad \frac{5}{12} \\ \frac{1}{4} \\ \hline \quad \frac{1}{3} \\ \frac{5}{9} \\ \hline \quad \frac{2}{3} \\ \frac{1}{12} \\ \hline \quad \frac{1}{2} \\ \frac{5}{6} \\ \hline \quad \frac{3}{5} \\ \frac{7}{10} \\ \hline \quad \frac{7}{8} \\ \frac{5}{16} \\ \hline \quad \frac{3}{4} \\ \frac{3}{8} \\ \hline$$

$$\begin{array}{r} 3. \quad 2\frac{1}{3} \\ 5\frac{1}{3} \\ \hline \end{array} \quad 6\frac{3}{7} \\ 3\frac{1}{7} \\ \hline \quad 7\frac{5}{16} \\ 1\frac{11}{16} \\ \hline \quad 8\frac{3}{5} \\ 4\frac{3}{5} \\ \hline \quad 3\frac{9}{10} \\ 9\frac{9}{10} \\ \hline \quad 6\frac{5}{9} \\ 5\frac{8}{9} \\ \hline$$

$$\begin{array}{r} 4. \quad 4\frac{3}{10} \\ 9\frac{1}{2} \\ \hline \end{array} \quad 2\frac{5}{12} \\ 7\frac{1}{6} \\ \hline \quad 13\frac{2}{5} \\ 8\frac{3}{10} \\ \hline \quad 17\frac{3}{4} \\ 9\frac{7}{8} \\ \hline \quad 21\frac{9}{16} \\ 10\frac{1}{2} \\ \hline \quad 38\frac{1}{6} \\ 8\frac{11}{12} \\ \hline$$

$$\begin{array}{r} 5. \quad 3\frac{2}{7} \\ 1\frac{1}{7} \\ 4\frac{3}{7} \\ \hline \end{array} \quad 5\frac{3}{8} \\ 2\frac{5}{8} \\ 6\frac{7}{8} \\ \hline \quad 9\frac{1}{5} \\ 7\frac{1}{2} \\ 3\frac{3}{10} \\ \hline \quad 4\frac{1}{2} \\ 9\frac{5}{12} \\ 2\frac{3}{4} \\ \hline \quad 6\frac{3}{8} \\ 6\frac{7}{16} \\ 5\frac{1}{4} \\ \hline \quad 8\frac{5}{6} \\ 7\frac{1}{2} \\ 6\frac{7}{12} \\ \hline$$

Subtract and check.

Each answer must be in lowest terms.

$$\begin{array}{r} 6. \quad \frac{7}{10} \\ \frac{1}{10} \\ \hline \end{array} \quad \frac{5}{7} \\ \frac{4}{7} \\ \hline \quad \frac{5}{8} \\ \frac{3}{8} \\ \hline \quad \frac{3}{4} \\ \frac{1}{2} \\ \hline \quad \frac{2}{3} \\ \frac{1}{6} \\ \hline \quad \frac{5}{6} \\ \frac{5}{12} \\ \hline \quad \frac{7}{16} \\ \frac{3}{8} \\ \hline \quad \frac{4}{5} \\ \frac{3}{10} \\ \hline$$

$$\begin{array}{r} 7. \quad 4\frac{3}{4} \\ 2\frac{1}{4} \\ \hline \end{array} \quad 7\frac{11}{12} \\ 3\frac{7}{12} \\ \hline \quad 9\frac{3}{10} \\ 5\frac{1}{10} \\ \hline \quad 8\frac{7}{8} \\ 6\frac{3}{4} \\ \hline \quad 6\frac{9}{10} \\ 2\frac{4}{5} \\ \hline \quad 2\frac{13}{16} \\ 1\frac{5}{8} \\ \hline$$

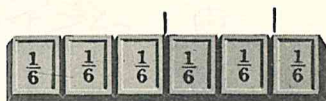
$$\begin{array}{r} 8. \quad 5 \\ \frac{2}{3} \\ \hline \end{array} \quad 8 \\ \frac{5}{16} \\ \hline \quad 6 \\ \frac{7}{12} \\ \hline \quad 9 \\ 2\frac{1}{4} \\ \hline \quad 11 \\ 3\frac{5}{8} \\ \hline \quad 13 \\ 9\frac{7}{10} \\ \hline$$

$$\begin{array}{r} 9. \quad 7\frac{1}{3} \\ 5\frac{2}{3} \\ \hline \end{array} \quad 4\frac{2}{5} \\ 2\frac{4}{5} \\ \hline \quad 2\frac{1}{10} \\ 1\frac{9}{10} \\ \hline \quad 15\frac{1}{6} \\ 7\frac{5}{6} \\ \hline \quad 12\frac{3}{16} \\ 8\frac{13}{16} \\ \hline \quad 4\frac{7}{12} \\ 3\frac{11}{12} \\ \hline$$

$$\begin{array}{r} 10. \quad 9\frac{3}{8} \\ 2\frac{3}{4} \\ \hline \end{array} \quad 6\frac{1}{12} \\ 1\frac{2}{3} \\ \hline \quad 5\frac{5}{16} \\ 4\frac{1}{2} \\ \hline \quad 11\frac{2}{5} \\ 6\frac{7}{10} \\ \hline \quad 14\frac{2}{3} \\ 7\frac{7}{9} \\ \hline \quad 22\frac{3}{8} \\ 13\frac{9}{16} \\ \hline$$

FINDING A COMMON DENOMINATOR

The chocolate bar on the right is divided into 6 equal blocks, so each block is $\frac{1}{6}$ of the chocolate bar.



Tom ate $\frac{1}{2}$ of the bar, and Leo ate $\frac{1}{3}$ of the bar. To find how much of the bar they both ate we add $\frac{1}{2}$ and $\frac{1}{3}$.

Only fractions with a common denominator can be added or subtracted.

Before we can add $\frac{1}{2}$ and $\frac{1}{3}$ they must have a *common denominator*. We cannot change $\frac{1}{2}$ to thirds or $\frac{1}{3}$ to halves.

Look at the bar above. Notice that $\frac{1}{2} = \frac{3}{6}$ and $\frac{1}{3} = \frac{2}{6}$. So $\frac{1}{2}$ and $\frac{1}{3}$ can be changed to the *common denominator sixths*. From the bar above we can see that $\frac{1}{2} + \frac{1}{3} = \frac{5}{6}$. Notice that the denominator 6 is the product of 2 and 3.

The common denominator of these unlike fraction is the *product* of their denominators.

$$\begin{array}{r} \text{Add. } \frac{1}{2} = \frac{3}{6} \\ \frac{1}{3} = \frac{2}{6} \\ \hline \frac{5}{6} \end{array}$$

When no number except 1 will divide into both denominators, the common denominator of the unlike fractions is the product of the denominators.

1. What common denominator would you use if you were adding $\frac{1}{4}$ and $\frac{1}{3}$? $\frac{2}{3}$ and $\frac{1}{5}$? $\frac{4}{5}$ and $\frac{5}{6}$? $\frac{3}{8}$ and $\frac{1}{3}$? $\frac{2}{5}$ and $\frac{3}{4}$?

2. What common denominator would you use if you were subtracting $\frac{1}{2}$ and $\frac{2}{5}$? $\frac{2}{3}$ and $\frac{1}{2}$? $\frac{3}{4}$ and $\frac{2}{3}$? $\frac{4}{5}$ and $\frac{1}{4}$? $\frac{1}{3}$ and $\frac{1}{5}$?

Add.

3.	$\frac{1}{2}$ $\frac{1}{5}$ 	$\frac{2}{5}$ $\frac{1}{3}$ 	$\frac{1}{3}$ $\frac{3}{8}$ 	$\frac{3}{4}$ $\frac{2}{5}$ 	$\frac{3}{7}$ $\frac{1}{2}$ 	$\frac{3}{5}$ $\frac{1}{6}$ 	$\frac{2}{5}$ $\frac{3}{8}$ 	$\frac{3}{4}$ $\frac{2}{15}$
4.	$\frac{2}{3}$ $\frac{1}{2}$ 	$\frac{1}{2}$ $\frac{4}{5}$ 	$\frac{7}{10}$ $\frac{1}{3}$ 	$\frac{5}{8}$ $\frac{2}{3}$ 	$\frac{1}{2}$ $\frac{8}{9}$ 	$\frac{3}{4}$ $\frac{2}{3}$ 	$\frac{5}{8}$ $\frac{12}{5}$ 	$\frac{4}{9}$ $\frac{3}{4}$



SPORTS DAY

Every spring the schools of Dreyton County have a Sports Day. The school that wins the most points carries off the trophy. Every boy tries to win for his school.

1. All the schools sell tickets for Sports' Day. Last year 276 tickets were sold. If the tickets cost 25¢ each, how much was taken in from the sale of the tickets?

2. The boys on the Royal School team bought uniforms for Sport's Day. If each shirt cost \$1.29 and each pair of trunks cost \$1.65, how much did the uniforms for the 8 boys on the team cost?

3. Bill won the 100 yd. dash; Roy was second. If Bill's time was $13\frac{1}{5}$ sec. and Roy's time was $14\frac{3}{10}$ sec., how much less time did Bill take than Roy?

4. In the running broad jump Allan jumped $16\frac{1}{2}$ ft. The best that Dick could do was $14\frac{3}{4}$ ft. How much farther did Allan jump than Dick?

5. There was a special event for the girls. In the potato race Dolly picked up all the potatoes in $53\frac{1}{2}$ sec. while Jean took only $48\frac{5}{6}$ sec. How many seconds more did Dolly take than Jean?

6. Royal School and Regal School met in the relay race. There were 4 boys on each team. For Royal School, Jack ran his 110 yd. in $16\frac{3}{4}$ sec.; Tony in 16 sec.; Frank in $15\frac{1}{2}$ sec.; and Phillip in $15\frac{1}{4}$ sec. How many seconds did it take the Royal team to run the relay race?

ADDING MIXED NUMBERS HAVING UNLIKE FRACTIONS

Mr. Toulon took his family by car to the County Exhibition. It took him $1\frac{2}{3}$ hr. to drive from his home to the Exhibition grounds, but because the traffic was heavy, it took $2\frac{2}{5}$ hr. to drive back home. How many hours did it take to drive both ways?

To find how many hours it took to drive, we add $1\frac{2}{3}$ and $2\frac{2}{5}$.

$$\begin{array}{r} 1\frac{2}{3} = 1\frac{10}{15} \\ 2\frac{2}{5} = 2\frac{6}{15} \\ \hline 4\frac{1}{15} \end{array}$$

Since no number except 1 divides evenly into 3 and 5, the common denominator is $3 \times 5 = 15$.

Change $\frac{2}{3}$ to $\frac{10}{15}$ and $\frac{2}{5}$ to $\frac{6}{15}$.

Add the fractions. $\frac{10}{15} + \frac{6}{15} = \frac{16}{15} = 1\frac{1}{15}$

Write the $\frac{1}{15}$ under the fractions. Carry the 1 and add it to the whole numbers.

So it took $4\frac{1}{15}$ hr. to drive both ways.

Add. Each answer must be in lower terms.

1. $4\frac{1}{2}$	$7\frac{1}{3}$	$3\frac{3}{4}$	$8\frac{1}{5}$	$2\frac{5}{8}$	$5\frac{1}{6}$
<u>$2\frac{1}{3}$</u>	<u>$1\frac{1}{4}$</u>	<u>$6\frac{1}{5}$</u>	<u>$4\frac{1}{4}$</u>	<u>$9\frac{1}{3}$</u>	<u>$6\frac{1}{5}$</u>

2. $9\frac{2}{7}$	$6\frac{3}{10}$	$7\frac{1}{2}$	$10\frac{1}{4}$	$8\frac{3}{5}$	$4\frac{3}{4}$
<u>$3\frac{1}{2}$</u>	<u>$8\frac{1}{5}$</u>	<u>$5\frac{2}{5}$</u>	<u>$2\frac{4}{15}$</u>	<u>$9\frac{1}{8}$</u>	<u>$11\frac{2}{9}$</u>

3. $6\frac{1}{2}$	$4\frac{4}{5}$	$5\frac{2}{3}$	$8\frac{7}{9}$	$9\frac{3}{4}$	$1\frac{7}{10}$
<u>$3\frac{3}{5}$</u>	<u>$7\frac{1}{3}$</u>	<u>$6\frac{3}{8}$</u>	<u>$8\frac{1}{2}$</u>	<u>$6\frac{2}{5}$</u>	<u>$9\frac{2}{3}$</u>

4. $12\frac{1}{4}$	$15\frac{6}{7}$	$17\frac{1}{3}$	$13\frac{9}{10}$	$26\frac{2}{3}$	$34\frac{5}{8}$
<u>$7\frac{4}{5}$</u>	<u>$8\frac{1}{2}$</u>	<u>$9\frac{3}{4}$</u>	<u>$12\frac{2}{3}$</u>	<u>$7\frac{7}{8}$</u>	<u>$9\frac{4}{5}$</u>

5. $18\frac{5}{6}$	$29\frac{3}{5}$	$32\frac{2}{3}$	$16\frac{2}{5}$	$47\frac{8}{9}$	$38\frac{2}{5}$
<u>$26\frac{4}{5}$</u>	<u>$5\frac{3}{4}$</u>	<u>$18\frac{4}{5}$</u>	<u>$46\frac{5}{8}$</u>	<u>$14\frac{3}{4}$</u>	<u>$25\frac{11}{12}$</u>

SUBTRACTING MIXED NUMBERS HAVING UNLIKE FRACTIONS

The distance from Newton to Oldport by the paved road is $37\frac{1}{3}$ mi.; by the gravel road the distance is $25\frac{7}{10}$ mi. How much shorter is the distance between Newton and Oldport by the gravel road?

To find how much shorter the distance is by the gravel road, we *subtract* $25\frac{7}{10}$ from $37\frac{1}{3}$.

The common denominator is

$$3 \times 10 = 30.$$

Change $\frac{1}{3}$ to $\frac{10}{30}$ and $\frac{7}{10}$ to $\frac{21}{30}$.

We cannot subtract $\frac{21}{30}$ from $\frac{10}{30}$.

Borrow 1 whole from 37 and

change it to $\frac{30}{30}$. So $37\frac{10}{30} = 36\frac{40}{30}$.

Subtract the fractions. $\frac{40}{30} - \frac{21}{30} = \frac{19}{30}$.

Subtract the whole numbers. $36 - 25 = 11$.

So the distance by gravel road is $11\frac{19}{30}$ mi. shorter.

$$\begin{array}{r} 37\frac{1}{3} = 37\frac{10}{30} = 36\frac{40}{30} \\ 25\frac{7}{10} = 25\frac{21}{30} = 25\frac{21}{30} \\ \hline 11\frac{19}{30} \end{array}$$

Subtract.

Each answer must be in lower terms.

- | | | | | | |
|---|---|--|---|---|--|
| 1. $\begin{array}{r} 4\frac{1}{2} \\ 2\frac{1}{3} \\ \hline \end{array}$ | $\begin{array}{r} 5\frac{1}{3} \\ 1\frac{1}{4} \\ \hline \end{array}$ | $\begin{array}{r} 7\frac{3}{5} \\ 5\frac{1}{3} \\ \hline \end{array}$ | $\begin{array}{r} 8\frac{1}{2} \\ 3\frac{3}{7} \\ \hline \end{array}$ | $\begin{array}{r} 9\frac{2}{3} \\ 6\frac{2}{5} \\ \hline \end{array}$ | $\begin{array}{r} 3\frac{1}{4} \\ 3\frac{1}{5} \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 6\frac{4}{5} \\ 4\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 12\frac{5}{6} \\ 3\frac{4}{5} \\ \hline \end{array}$ | $\begin{array}{r} 13\frac{7}{10} \\ 9\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 11\frac{3}{5} \\ 6\frac{3}{8} \\ \hline \end{array}$ | $\begin{array}{r} 17\frac{2}{3} \\ 8\frac{7}{15} \\ \hline \end{array}$ | $\begin{array}{r} 14\frac{11}{12} \\ 5\frac{3}{5} \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 5\frac{1}{2} \\ 3\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 7\frac{2}{5} \\ 2\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 9\frac{2}{3} \\ 5\frac{3}{4} \\ \hline \end{array}$ | $\begin{array}{r} 8\frac{1}{4} \\ 1\frac{4}{5} \\ \hline \end{array}$ | $\begin{array}{r} 6\frac{3}{7} \\ 3\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 2\frac{1}{3} \\ 1\frac{3}{5} \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 10\frac{1}{2} \\ 7\frac{8}{9} \\ \hline \end{array}$ | $\begin{array}{r} 14\frac{3}{8} \\ 8\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 12\frac{1}{5} \\ 6\frac{1}{4} \\ \hline \end{array}$ | $\begin{array}{r} 16\frac{2}{5} \\ 9\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 18\frac{1}{6} \\ 8\frac{4}{5} \\ \hline \end{array}$ | $\begin{array}{r} 13\frac{2}{3} \\ 5\frac{7}{8} \\ \hline \end{array}$ |
| 5. $\begin{array}{r} 15\frac{3}{5} \\ 4\frac{2}{3} \\ \hline \end{array}$ | $\begin{array}{r} 21\frac{4}{15} \\ 3\frac{1}{2} \\ \hline \end{array}$ | $\begin{array}{r} 36\frac{2}{3} \\ 24\frac{9}{10} \\ \hline \end{array}$ | $\begin{array}{r} 27\frac{4}{5} \\ 19\frac{11}{12} \\ \hline \end{array}$ | $\begin{array}{r} 42\frac{2}{5} \\ 23\frac{5}{6} \\ \hline \end{array}$ | $\begin{array}{r} 77\frac{3}{8} \\ 58\frac{4}{5} \\ \hline \end{array}$ |



PROBLEMS USING FRACTIONS

1. Allan and Doug were on a bicycle tour. They left one town to go to Troy a distance of $23\frac{3}{4}$ mi. When they had travelled $16\frac{1}{3}$ mi. they stopped for lunch. How much further did they still have to go to get to Troy?
2. It is exactly a mile from Tony's home to the school. Yesterday, Tony walked from his home to school in $18\frac{1}{2}$ min. He ran home in $7\frac{4}{5}$ min. How much longer did it take him to get to school than to get home?
3. Lillian was helping her father to pick tomatoes. She put $3\frac{1}{2}$ doz. tomatoes in one basket and $4\frac{1}{6}$ doz. in another basket. How many dozen did she pick?
4. Terry wants to be a good tennis player. On Monday he practised for $2\frac{4}{5}$ hr. and on Tuesday for $1\frac{2}{3}$ hr. How many hours did Terry practise altogether?
5. At the school games George won the high jump with a jump of $4\frac{1}{3}$ ft. Fred was second with a jump of $3\frac{3}{4}$ ft. How much higher did George jump than Fred?
6. Winnie is fond of sweets. Last evening she used $2\frac{2}{3}$ cups of white sugar and $1\frac{1}{4}$ cups of brown sugar to make candy. How much sugar did she use altogether?
7. It takes a train $12\frac{1}{6}$ hr. to travel between two cities. Mr. Gregor drove his car from one of these cities to the other in $8\frac{3}{5}$ hr. How much time did he save?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	3754	3847	5925	6149	1609
	4483	7294	8398	5496	6599
	7036	2443	2774	7621	146
	6570	3079	9545	2055	6904
	2625	4760	3064	5163	9268
	<u>6351</u>	<u>3884</u>	<u>5198</u>	<u>1588</u>	<u>966</u>

Subtract. Check each exercise.

2.	87492	45928	59330	83729	16071
	<u>62839</u>	<u>19475</u>	<u>57618</u>	<u>78656</u>	<u>13716</u>
3.	63425	76341	32734	62782	82631
	<u>13866</u>	<u>38647</u>	<u>25879</u>	<u>52988</u>	<u>13789</u>
4.	30805	50003	70500	40004	30000
	<u>17017</u>	<u>47868</u>	<u>50031</u>	<u>34915</u>	<u>20084</u>

Multiply. Check each exercise.

5.	3896	2857	5068	6529	9376
	<u>4</u>	<u>7</u>	<u>9</u>	<u>6</u>	<u>8</u>
6.	48	74	89	246	608
	<u>30</u>	<u>29</u>	<u>85</u>	<u>37</u>	<u>64</u>
7.	257	579	943	746	957
	<u>146</u>	<u>378</u>	<u>500</u>	<u>680</u>	<u>409</u>
					<u>864</u>
					<u>705</u>

Divide. Check each exercise.

8.	53)28378	68)50754	17)11458	75)71462
9.	82)37720	49)13236	24)21744	65)52271
10.	136)31824	384)52073	537)269574	

KEEPING THE TOOLS SHARP

Add. Each answer must be in lowest terms.

- | | | | | | | |
|----|--|---|--|---|--|---|
| 1. | $\frac{3}{16}$
$\frac{8}{16}$
<hr/> | $\frac{5}{12}$
$\frac{11}{12}$
<hr/> | $\frac{3}{10}$
$\frac{2}{5}$
<hr/> | $\frac{7}{8}$
$\frac{5}{16}$
<hr/> | $\frac{1}{3}$
$\frac{1}{2}$
<hr/> | $\frac{4}{5}$
$\frac{3}{4}$
<hr/> |
| 2. | $1\frac{3}{8}$
$4\frac{1}{8}$
<hr/> | $3\frac{9}{10}$
$6\frac{7}{10}$
<hr/> | $7\frac{1}{2}$
$2\frac{5}{8}$
<hr/> | $8\frac{9}{16}$
$5\frac{1}{4}$
<hr/> | $3\frac{5}{9}$
$1\frac{2}{3}$
<hr/> | $4\frac{3}{16}$
$7\frac{3}{8}$
<hr/> |
| 3. | $2\frac{1}{2}$
$3\frac{5}{6}$
<hr/> | $8\frac{1}{8}$
$7\frac{3}{4}$
<hr/> | $5\frac{5}{6}$
$6\frac{7}{12}$
<hr/> | $10\frac{2}{5}$
$2\frac{7}{20}$
<hr/> | $7\frac{11}{16}$
$12\frac{1}{2}$
<hr/> | $15\frac{1}{3}$
$3\frac{1}{4}$
<hr/> |
| 4. | $9\frac{1}{3}$
$5\frac{9}{10}$
<hr/> | $1\frac{2}{5}$
$2\frac{5}{6}$
<hr/> | $8\frac{5}{8}$
$4\frac{2}{3}$
<hr/> | $13\frac{1}{2}$
$3\frac{3}{5}$
<hr/> | $15\frac{4}{5}$
$6\frac{1}{6}$
<hr/> | $21\frac{2}{3}$
$8\frac{1}{2}$
<hr/> |
| 5. | $7\frac{1}{4}$
$3\frac{4}{5}$
<hr/> | $5\frac{3}{5}$
$4\frac{1}{3}$
<hr/> | $6\frac{1}{6}$
$7\frac{3}{5}$
<hr/> | $9\frac{3}{10}$
$11\frac{2}{3}$
<hr/> | $16\frac{2}{5}$
$3\frac{3}{4}$
<hr/> | $31\frac{4}{5}$
$12\frac{2}{3}$
<hr/> |

Subtract Each answer must be in lowest terms.

- | | | | | | | |
|-----|--|--|--|--|--|--|
| 6. | $\frac{5}{8}$
$\frac{3}{8}$
<hr/> | $\frac{7}{10}$
$\frac{3}{10}$
<hr/> | $\frac{2}{3}$
$\frac{1}{12}$
<hr/> | $\frac{9}{10}$
$\frac{4}{5}$
<hr/> | $\frac{3}{4}$
$\frac{5}{16}$
<hr/> | $\frac{5}{6}$
$\frac{3}{5}$
<hr/> |
| 7. | $6\frac{13}{16}$
$2\frac{7}{16}$
<hr/> | $3\frac{4}{5}$
$1\frac{1}{5}$
<hr/> | 8
$\frac{5}{6}$
<hr/> | 10
$\frac{1}{3}$
<hr/> | 9
$4\frac{3}{8}$
<hr/> | 11
$5\frac{7}{10}$
<hr/> |
| 8. | $7\frac{3}{8}$
$3\frac{5}{8}$
<hr/> | $5\frac{1}{4}$
$\frac{3}{4}$
<hr/> | $6\frac{5}{6}$
$4\frac{1}{2}$
<hr/> | $11\frac{2}{3}$
$5\frac{5}{12}$
<hr/> | $4\frac{2}{5}$
$3\frac{7}{10}$
<hr/> | $8\frac{3}{16}$
$\frac{3}{4}$
<hr/> |
| 9. | $8\frac{1}{2}$
$2\frac{11}{12}$
<hr/> | $11\frac{1}{3}$
$6\frac{5}{6}$
<hr/> | $7\frac{2}{5}$
$\frac{9}{20}$
<hr/> | $13\frac{3}{8}$
$7\frac{11}{16}$
<hr/> | $5\frac{1}{2}$
$1\frac{1}{3}$
<hr/> | $12\frac{3}{4}$
$7\frac{2}{5}$
<hr/> |
| 10. | $4\frac{2}{3}$
$2\frac{1}{4}$
<hr/> | $8\frac{5}{6}$
$7\frac{2}{5}$
<hr/> | $14\frac{1}{4}$
$3\frac{4}{5}$
<hr/> | $9\frac{1}{6}$
$\frac{3}{5}$
<hr/> | $5\frac{1}{3}$
$4\frac{3}{4}$
<hr/> | $11\frac{1}{6}$
$7\frac{4}{5}$
<hr/> |

FINDING THE LEAST COMMON DENOMINATOR

Only fractions which have the same common denominator can be added or subtracted.

We shall save time if we use the *least common denominator*, that is, the smallest denominator into which each of the denominators divides evenly.

I. The least common denominator of $\frac{3}{4}$ and $\frac{5}{16}$ is 16. Notice that 4 divides evenly into 16. In this case the least common denominator is the larger of the denominators of one of the fractions.

II. The least common denominator of $\frac{2}{3}$ and $\frac{2}{5}$ is 15, which is the product of 3 and 5. The smallest number into which both 3 and 5 will divide evenly is 15.

III. What is the least common denominator of $\frac{5}{6}$ and $\frac{3}{10}$? It is not 10, the larger denominator, because 6 will not divide evenly into 10. It is not the product, $6 \times 10 = 60$, because both 6 and 10 will divide evenly into the smaller number, 30, which is the least common denominator of $\frac{5}{6}$ and $\frac{3}{10}$.

Find the least common denominator of $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{3}{8}$.

- (1) Take the largest denominator, 8. Do both 3 and 4 divide evenly into 8? No. Then 8 is not the least common denominator.
- (2) Multiply 8 by 2. $2 \times 8 = 16$. Do both 3 and 4 divide evenly into 16? No. Then 16 is not the least common denominator.
- (3) Multiply 8 by 3. $3 \times 8 = 24$. Do both 3 and 4 divide evenly into 24? Yes. Then 24 is the least common denominator of $\frac{2}{3}$, $\frac{1}{4}$, and $\frac{3}{8}$.
If 24 would not work, you should try 4×8 , 5×8 , etc. until you find the least common denominator.

1. Find the least common denominator of $\frac{3}{4}$ and $\frac{1}{6}$; of $\frac{1}{4}$ and $\frac{7}{10}$; of $\frac{5}{8}$ and $\frac{5}{6}$; of $\frac{3}{10}$ and $\frac{3}{8}$; of $\frac{5}{8}$ and $\frac{1}{12}$; of $\frac{5}{9}$ and $\frac{7}{12}$; of $\frac{1}{2}$, $\frac{2}{3}$, and $\frac{1}{4}$; of $\frac{1}{2}$, $\frac{5}{8}$, and $\frac{3}{4}$; of $\frac{1}{8}$, $\frac{5}{8}$, and $\frac{1}{4}$; of $\frac{1}{3}$, $\frac{5}{6}$, and $\frac{1}{10}$; of $\frac{3}{4}$, $\frac{7}{10}$, and $\frac{5}{12}$; of $\frac{1}{2}$, $\frac{4}{15}$, and $\frac{3}{5}$.

ARRANGING FRACTIONS ACCORDING TO SIZE

Arrange $\frac{5}{6}$, $\frac{5}{8}$, and $\frac{3}{4}$ according to size from the smallest to the largest.

Before fractions can be compared or arranged they must have the same denominator.

The *least common denominator* of $\frac{5}{6}$, $\frac{5}{8}$, $\frac{3}{4}$ is 24.

Change each fraction to "twenty-fourths" as shown.

$$\frac{5}{6} = \frac{20}{24}$$



$$\frac{5}{8} = \frac{15}{24}$$



$$\frac{3}{4} = \frac{18}{24}$$



Now since the fractions have the same denominator we can tell from the numerators the sizes of the fractions. The fraction with the smallest numerator is the smallest; the one with the largest numerator is the largest, etc.

So, in order of size from the smallest to the largest, the fractions should be arranged: $\frac{5}{8}$, $\frac{3}{4}$, $\frac{5}{6}$.

1. Which is the larger: $\frac{1}{2}$ or $\frac{3}{5}$? $\frac{7}{8}$ or $\frac{2}{3}$?
2. Which is the smaller: $\frac{7}{10}$ or $\frac{3}{4}$? $\frac{5}{12}$ or $\frac{1}{2}$?
3. Which of these fractions is the largest: $\frac{2}{3}$, $\frac{3}{4}$, $\frac{7}{12}$?
4. Which of the fractions is the smallest: $\frac{1}{4}$, $\frac{3}{8}$, $\frac{3}{16}$?

Arrange the groups of fractions below in order of size from the smallest to the largest:

5. $\frac{7}{8}$, $\frac{3}{4}$, $\frac{9}{16}$

$\frac{5}{6}$, $\frac{1}{2}$, $\frac{3}{4}$

$\frac{1}{2}$, $\frac{3}{5}$, $\frac{2}{3}$

6. $\frac{4}{5}$, $\frac{7}{10}$, $\frac{3}{4}$

$\frac{2}{3}$, $\frac{5}{6}$, $\frac{11}{12}$

$\frac{3}{4}$, $\frac{5}{8}$, $\frac{7}{12}$

Arrange the groups of fractions below in order of size from the largest to the smallest:

7. $\frac{3}{4}$, $\frac{1}{2}$, $\frac{7}{10}$

$\frac{2}{3}$, $\frac{7}{9}$, $\frac{13}{18}$

$\frac{7}{12}$, $\frac{1}{2}$, $\frac{5}{6}$

8. $\frac{3}{10}$, $\frac{2}{5}$, $\frac{1}{4}$

$\frac{1}{2}$, $\frac{7}{16}$, $\frac{5}{8}$

$\frac{11}{12}$, $\frac{5}{6}$, $\frac{8}{9}$

9. Use a drawing to show which is larger, $\frac{3}{4}$ or $\frac{9}{16}$.

ADDING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

Ronald is taking violin lessons. On Monday he practised $2\frac{3}{4}$ hr.; on Tuesday, $2\frac{1}{2}$ hr.; and on Wednesday, $1\frac{2}{3}$ hr. How many hours did he practise during the three days?

$$\begin{array}{l} 2\frac{3}{4} = 2\frac{9}{12} \\ 2\frac{1}{2} = 2\frac{6}{12} \\ 1\frac{2}{3} = 1\frac{8}{12} \\ \hline 6\frac{11}{12} \end{array}$$

Find the least common denominator.

Multiply the largest denominator, 4, by 2.
 $2 \times 4 = 8$.

But both 2 and 3 do not divide evenly into 8.
 Multiply 4 by 3. $3 \times 4 = 12$.

Both 2 and 3 divide evenly into 12.

So the *least common denominator* is 12.

Change $\frac{3}{4}$ to $\frac{9}{12}$; $\frac{1}{2}$ to $\frac{6}{12}$; $\frac{2}{3}$ to $\frac{8}{12}$.

Add the fractions: $\frac{9}{12} + \frac{6}{12} + \frac{8}{12} = \frac{23}{12} = 1\frac{11}{12}$

Write the $1\frac{11}{12}$ and CARRY the 1 and add it to the whole numbers.

So Ronald practised for $6\frac{11}{12}$ hr.

Add. Each answer must be in lowest terms.

1. $\frac{1}{4} + \frac{1}{6} = \frac{3}{10} + \frac{1}{8} = \frac{3}{4} + \frac{4}{9} = \frac{7}{12} + \frac{1}{10} = \frac{1}{6} + \frac{1}{9} = \frac{5}{10}$
2. $\frac{5}{6} + \frac{9}{10} = \frac{11}{12} + \frac{7}{9} = \frac{7}{10} + \frac{3}{4} = \frac{5}{6} + \frac{3}{8} = \frac{5}{6} + \frac{9}{10} = \frac{7}{12} + \frac{8}{9}$
3. $2\frac{1}{6} + 4\frac{3}{10} = 5\frac{5}{6} + 9\frac{7}{10} = 8\frac{5}{8} + 11\frac{1}{6} = 3\frac{3}{8} + 6\frac{1}{4} = 7\frac{1}{9} + 4\frac{1}{6} = 9\frac{3}{10} + 5\frac{7}{15}$
4. $1\frac{5}{6} + 5\frac{9}{10} = 6\frac{7}{8} + 10\frac{5}{6} = 12\frac{13}{15} + 27\frac{7}{12} = 2\frac{1}{4} + 3\frac{3}{8} = 8\frac{5}{12} + 7\frac{5}{8} = 9\frac{5}{6} + 14\frac{7}{9}$
5. $1\frac{1}{2} + 2\frac{1}{3} = 4\frac{3}{8} + 1\frac{3}{5} = 10\frac{5}{6} + 12\frac{7}{10} = 3\frac{1}{6} + 5\frac{1}{8} = 3\frac{1}{2} + 7\frac{1}{2} = 4\frac{2}{3} + 21\frac{5}{12} = 2\frac{1}{4} + 3\frac{1}{6} = 6\frac{7}{12} + 8\frac{2}{3} = 15\frac{3}{10} + 19\frac{3}{4}$

SUBTRACTING FRACTIONS AND MIXED NUMBERS WHEN THE FRACTIONS ARE UNLIKE

Henry's father is $6\frac{1}{4}$ ft. tall. Bill's father is $5\frac{5}{6}$ ft. tall.
How much taller is Henry's father than Bill's father?

Find the least common denominator.

Multiply the larger denominator, 6 by 2. $2 \times 6 = 12$.

Both 4 and 6 divide evenly into 12.

So the *least common denominator* is 12.

Change $\frac{1}{4}$ to $\frac{3}{12}$ and $\frac{5}{6}$ to $\frac{10}{12}$.

We cannot subtract $\frac{10}{12}$ from $\frac{3}{12}$.

Borrow 1 whole from 6 and change it to $\frac{12}{12}$. So $6\frac{3}{12} = 5\frac{15}{12}$.

Subtract the fractions, $\frac{15}{12} - \frac{10}{12} = \frac{5}{12}$.

Subtract the whole numbers, $5 - 5 = 0$.

So Henry's father is $\frac{5}{12}$ ft. taller.

$$\begin{array}{r} 6\frac{1}{4} = 6\frac{3}{12} = 5\frac{15}{12} \\ 5\frac{5}{6} = 5\frac{10}{12} = 5\frac{10}{12} \\ \hline \frac{5}{12} \end{array}$$

Subtract. Each answer must be in lowest terms.

$$\begin{array}{r} 1. \quad \frac{1}{4} - \frac{5}{6} = \frac{9}{10} - \frac{7}{8} = \frac{5}{12} - \frac{5}{8} = \frac{9}{10} - \frac{11}{12} \\ \frac{1}{6} - \frac{1}{9} = \frac{3}{4} - \frac{5}{6} = \frac{3}{8} - \frac{3}{10} = \frac{5}{6} - \frac{7}{10} \end{array}$$

$$\begin{array}{r} 2. \quad \frac{5}{6} - \frac{1}{4} = \frac{5}{8} - \frac{7}{12} = \frac{9}{10} - \frac{5}{6} = \frac{7}{8} - \frac{8}{9} \\ \frac{4}{9} - \frac{1}{10} = \frac{1}{12} - \frac{3}{8} = \frac{5}{12} - \frac{5}{8} = \frac{7}{12} - \frac{1}{12} \end{array}$$

$$\begin{array}{r} 3. \quad 4\frac{1}{6} - 6\frac{1}{8} = 9\frac{1}{4} - 3\frac{7}{9} = 8\frac{3}{8} - 7\frac{1}{8} \\ 1\frac{3}{4} - 5\frac{1}{6} = 6\frac{3}{10} - 1\frac{5}{8} = 5\frac{7}{10} - 1\frac{9}{10} \end{array}$$

$$\begin{array}{r} 4. \quad 6\frac{1}{10} - 2\frac{5}{8} = 8\frac{1}{6} - 9\frac{5}{6} = 13\frac{1}{12} - 11\frac{2}{15} \\ 2\frac{1}{4} - 1\frac{11}{12} = 4\frac{5}{9} - 8\frac{7}{8} = 7\frac{3}{8} - 4\frac{5}{6} \end{array}$$

$$\begin{array}{r} 5. \quad 14\frac{3}{10} - 8\frac{5}{8} = 17\frac{1}{6} - 9\frac{7}{15} = 16\frac{4}{9} - 8\frac{11}{12} = 15\frac{1}{6} - 7\frac{8}{15} \\ 12\frac{1}{10} - 6\frac{5}{6} = 42\frac{5}{12} - 29\frac{7}{10} \end{array}$$



PROBLEMS USING FRACTIONS

1. The most interesting race at the Sunday school picnic last summer was the 100-yard dash. Dick ran the 100 yards in $13\frac{1}{4}$ sec. and Peter ran it in $14\frac{7}{10}$ sec. How many seconds faster was Dick's time than Peter's?

2. Jim and his father like baseball. During the vacation they saw a "double-header". The first game took $2\frac{1}{6}$ hr. and the second game, $1\frac{3}{4}$ hr. How long did it take to play both games?

3. On a hike, a troop of boy scouts walked $4\frac{7}{10}$ mi. in the morning and $5\frac{3}{8}$ miles in the afternoon. How many miles did they hike that day?

4. Jean likes to go to school and she always has her lessons well prepared. Last evening she studied Arithmetic for $\frac{1}{4}$ hr.; English for $\frac{5}{6}$ hr.; and Geography for $\frac{1}{2}$ hr. How long did Jean study last evening?

5. It is Betty's job to gather the eggs from the hen-coop. On Wednesday she got $3\frac{1}{6}$ doz. eggs; on Thursday, $3\frac{1}{3}$ doz.; and on Friday, $2\frac{3}{4}$ doz. How many dozen eggs did she gather during the three days?

6. Alfie and Gordon like to fish. Yesterday they were comparing their fishing lines. Alfie's line was $14\frac{3}{4}$ yd. long, and Gordon's was $12\frac{5}{8}$ yd. long. How much shorter was Gordon's line than Alfie's?

7. Mr. Westpum had three loads of coal put in his cellar. In the first load there were $3\frac{1}{2}$ tons; in the second, $2\frac{3}{4}$ tons; and in the third, $3\frac{1}{3}$ tons. How many tons of coal did he get altogether?

DIAGNOSTIC TEST IN ADDITION OF FRACTIONS

The work below will test you on the kinds of examples you should know in addition of fractions. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

ADDING LIKE FRACTIONS AND MIXED NUMBERS HAVING LIKE FRACTIONS					Page	
1.	$\frac{3}{16}$ $\frac{9}{16}$	$5\frac{1}{8}$ $2\frac{3}{8}$	$6\frac{3}{5}$ $4\frac{4}{5}$	$2\frac{7}{10}$ $8\frac{7}{10}$	$1\frac{7}{12}$ $3\frac{11}{12}$	69) 74)
ADDING UNLIKE FRACTIONS AND MIXED NUMBERS HAVING UNLIKE FRACTIONS						
(a) The common denominator is the denonina- tor of one of the fractions.						
2.	$\frac{1}{3}$ $\frac{4}{9}$	$\frac{7}{12}$ $\frac{1}{6}$	$\frac{5}{8}$ $\frac{11}{16}$	$\frac{2}{3}$ $\frac{5}{6}$	$\frac{3}{4}$ $\frac{11}{20}$	79
(b) The common denominator is the product of the denominators.						
3.	$\frac{2}{5}$ $\frac{1}{8}$	$3\frac{1}{4}$ $6\frac{5}{9}$	$8\frac{5}{7}$ $2\frac{1}{2}$	$6\frac{5}{6}$ $9\frac{1}{5}$	$4\frac{4}{5}$ $5\frac{3}{4}$	85
(c) Find the least common denominator.						
4.	$\frac{3}{8}$ $\frac{7}{12}$	$7\frac{7}{10}$ $8\frac{1}{4}$	$9\frac{5}{6}$ $5\frac{3}{8}$	$4\frac{7}{9}$ $7\frac{5}{12}$	$5\frac{9}{10}$ $6\frac{5}{6}$	92
ADDING FRACTIONS AND MIXED NUMBERS WITH THREE ADDENDS						
5.	$\frac{3}{16}$ $\frac{1}{16}$ $\frac{5}{16}$	$\frac{3}{4}$ $\frac{7}{8}$ $\frac{1}{2}$	$1\frac{1}{2}$ $5\frac{3}{4}$ $6\frac{2}{3}$	$4\frac{3}{5}$ $3\frac{5}{6}$ $5\frac{3}{10}$	$8\frac{7}{12}$ $4\frac{1}{3}$ $9\frac{5}{8}$	69) 74) 79) 92)

DIAGNOSTIC TEST IN SUBTRACTION OF FRACTIONS

The work below will test you on the kinds of examples you should know in subtraction of fractions. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

SUBTRACTING FRACTIONS AND MIXED NUMBERS HAVING LIKE FRACTIONS					Page
1.	$\frac{3}{8}$ $\frac{1}{8}$ 	$\frac{11}{12}$ $\frac{1}{12}$ 	$2\frac{4}{5}$ $\frac{13}{5}$ 	$6\frac{9}{10}$ $\frac{3}{10}$ 	70
2.	$3\frac{1}{6}$ $1\frac{5}{6}$ 	$5\frac{2}{9}$ $\frac{7}{9}$ 	$8\frac{1}{4}$ $6\frac{3}{4}$ 	$9\frac{5}{8}$ $3\frac{7}{8}$ 	76

SUBTRACTING UNLIKE FRACTIONS AND MIXED NUMBERS HAVING UNLIKE FRACTIONS					
(a) The common denominator is the denominator of one of the fractions.					
3.	$\frac{1}{2}$ $\frac{1}{6}$ 	$\frac{2}{3}$ $\frac{7}{12}$ 	$4\frac{5}{16}$ $1\frac{3}{4}$ 	$7\frac{8}{9}$ $4\frac{2}{3}$ 	80
4.	$5\frac{1}{8}$ $2\frac{1}{2}$ 	$9\frac{3}{16}$ $4\frac{7}{8}$ 	$10\frac{5}{12}$ $3\frac{5}{6}$ 	$12\frac{3}{5}$ $7\frac{9}{10}$ 	
(b) The common denominator is the product of the denominators.					
5.	$\frac{1}{2}$ $\frac{1}{5}$ 	$\frac{2}{3}$ $\frac{1}{2}$ 	$6\frac{7}{8}$ $1\frac{2}{3}$ 	$8\frac{3}{4}$ $5\frac{2}{5}$ 	86
6.	$9\frac{1}{4}$ $7\frac{1}{3}$ 	$2\frac{1}{3}$ $1\frac{5}{8}$ 	$7\frac{2}{9}$ $6\frac{1}{2}$ 	$15\frac{1}{2}$ $7\frac{11}{15}$ 	
(c) Find the least common denominator.					
7.	$\frac{5}{6}$ $\frac{3}{4}$ 	$\frac{7}{10}$ $\frac{5}{8}$ 	$5\frac{1}{6}$ $1\frac{1}{8}$ 	$6\frac{9}{10}$ $5\frac{1}{6}$ 	93
8.	$5\frac{3}{4}$ $\frac{9}{10}$ 	$3\frac{2}{9}$ $2\frac{5}{6}$ 	$11\frac{3}{8}$ $6\frac{7}{12}$ 	$13\frac{1}{6}$ $8\frac{3}{4}$ 	



THE SCHOOL PLAY

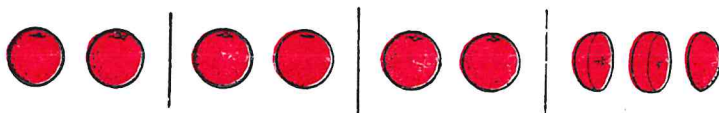
Grade VI class put on a play to raise money for the Crippled Children's Fund. Besides doing a very good thing they had a lot of fun and learned a great deal.

1. When the play was ready the boys and girls sold 276 tickets at \$.15 each. How much did they take in from the sale of the tickets?
2. Alice wanted to play the part of the leading lady but the leading lady had to be 4 ft. tall. Alice was only $3\frac{5}{8}$ ft. tall. How much too short was she?
3. The teacher bought $2\frac{2}{3}$ yd. of cloth for Joan's costume and $2\frac{1}{2}$ yd. for Winnie's costume. How many yards of cloth did the two costumes take?
4. It took $10\frac{1}{2}$ yd. of white paper and $8\frac{3}{4}$ yd. of blue crepe paper to decorate the stage. How many yards of crepe paper were used?
5. Joan and Winnie wanted to be sure they knew their parts well. The day before the play Joan practised $2\frac{1}{3}$ hr. and Winnie practised $1\frac{5}{6}$ hr. How much longer did Joan practise than Winnie?
6. The pupils who were not in the play made some money by selling candy at the play. If they had $9\frac{1}{4}$ lb. of candy and sold $7\frac{5}{8}$ lb., how many pounds were left?
7. If they made \$50.40 by selling tickets and candy and the expenses of the play were \$8.95, how much did Grade VI have to give the Crippled Children's Fund?

WRITING REMAINDERS AS FRACTIONS

Three boys, Pete, Joe, and Hal, had enough money among them to buy 7 oranges. If they divided the oranges evenly, how many oranges would each boy get?

Below we see the seven oranges.



We can see that each boy got 2 whole oranges and $\frac{1}{3}$ of the other orange.

So each boy got $2\frac{1}{3}$ oranges.

Here is a short way to find how many oranges each boy got.

$$\begin{array}{r} 2\frac{1}{3} \\ 3 \overline{)7} \\ \underline{6} \\ 1 \end{array}$$

Think, "3's in 7 are 2". Write the 2 as shown.

Write the remainder, 1, as the numerator of a fraction with the divisor, 3, as the denominator.

Write the $\frac{1}{3}$ as shown.

So each boy got $2\frac{1}{3}$ oranges.

Rule: *In division, the remainder may be changed to a fraction by writing the remainder as the numerator and the divisor as the denominator of the fraction. The fraction must always be changed to lowest terms.*

Divide. Write the remainders as fractions in lowest terms.

1. $4 \overline{)13}$

$3 \overline{)11}$

$5 \overline{)28}$

$6 \overline{)34}$

$4 \overline{)30}$

2. $7 \overline{)115}$

$6 \overline{)218}$

$4 \overline{)637}$

$8 \overline{)332}$

$9 \overline{)222}$

3. Mr. Todd sold 8 dressed lambs to a meat store. If the total weight of the lambs was 326 lb., what was the average weight of the lambs?

4. If 69 qt. of plums are put in 6 baskets, how many quarts will there be to a basket if each basket holds the same amount?

USING COMMON SENSE IN WRITING REMAINDERS

When there is a remainder in a division problem, *the remainder should sometimes be left as a whole number, and sometimes it should be written as a fraction.* Common sense will tell you what to do. Study the examples below.

If 32 marbles are divided evenly among 5 boys, how many marbles will each boy get?

To find out we divide 32 by 5.

Each boy would get 6 marbles and there would be 2 marbles left over. It is *not sensible or reasonable* to divide 2 marbles among 5 boys. So the remainder, 2, must be left as a *whole number*.

Example I.

$$\begin{array}{r} 6 \\ 5 \overline{)32} \\ \underline{30} \\ 2 \end{array}$$

If 13 yd. of curtain material is cut into 4 equal parts, how long will each part be?

To find out we divide 13 by 4.

Each part will be $3\frac{1}{4}$ yd. long. It is *sensible and reasonable* to divide a piece of curtain material into fractional parts. So the remainder, 1, should be written as a fraction, $\frac{1}{4}$.

Example II.

$$\begin{array}{r} 3\frac{1}{4} \\ 4 \overline{)13} \\ \underline{12} \\ 1 \end{array}$$

Be sure the way you write the remainder is sensible.

1. How many 5¢ pencils can Allan buy with 38¢?
2. If a board 18 ft. long is cut into 4 equal pieces, how long will each piece be?
3. How many baseball teams can be picked from 30 players if each team has 9 players?
4. How many complete rows of chairs can be made with 150 chairs if there are 12 chairs to a row?
5. The Wellard family used 75 qt. of milk in 30 da. How many quarts a day did they use on the average?
6. The total weight of 6 boys on a hockey team is 591 lb. What is the average weight of the boys?

THE MEANING OF MULTIPLYING WHOLE NUMBERS AND FRACTIONS

I. *Multiplying a fraction by a whole number.*

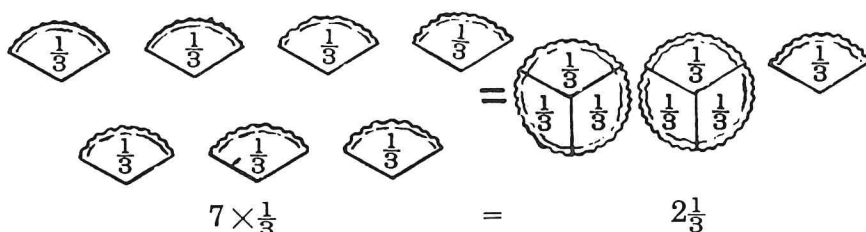
If Frankie eats $\frac{1}{3}$ of a pie each day, how many pies will he eat in 7 days?

To find out we can *multiply* $7 \times \frac{1}{3}$

Since multiplication is a short way of adding numbers that are the same, $7 \times \frac{1}{3} = \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{7}{3} = 2\frac{1}{3}$

So, $7 \times \frac{1}{3} = \frac{7}{3} = 2\frac{1}{3}$

You can see that this is so from the pictures below.



II. *Multiplying a whole number by a fraction.*

Suppose we multiply 7 by $\frac{1}{3}$ which we write, $\frac{1}{3} \times 7$.

We know that $5 \times 4 = 4 \times 5$ and $9 \times 6 = 6 \times 9$.

Hence $\frac{1}{3} \times 7 = 7 \times \frac{1}{3}$

So, $\frac{1}{3} \times 7 = \frac{7}{3} = 2\frac{1}{3}$

We also know that $\frac{1}{3} \times 7 = \frac{1}{3}$ of 7 which is $2\frac{1}{3}$. Of means *multiply*.

If we look at the two blocks above we can *discover* a rule for multiplying a whole number and a fraction.

Rule: To multiply a whole number and a fraction, multiply the whole number by the numerator of the fraction and divide the product by the denominator of the fraction. Be sure the fraction in the answer is in lowest terms.

MULTIPLYING WHOLE NUMBERS AND FRACTIONS

Rita's mother bought $\frac{3}{4}$ of a pound of breakfast bacon at 68¢ a pound. How much did she pay for the bacon?

To find out how much she paid for the bacon we must find $\frac{3}{4}$ of 68 which means $\frac{3}{4} \times 68$.

Multiply 68 by the numerator, 3,

$$\frac{3}{4} \times 68 = \frac{204}{4} = 51$$

$$3 \times 68 = 204.$$

Divide the product, 204, by the denominator, 4. $\frac{204}{4} = 51$

So she paid 51¢ for the bacon.

Tell how these
are done



$$12 \times \frac{3}{8} = \frac{36}{8} = 4\frac{4}{8} = 4\frac{1}{2}$$

$$9 \times \frac{2}{3} = \frac{18}{3} = 6 \text{ and } \frac{3}{10} \times 2 = \frac{6}{10} = \frac{3}{5}$$

Multiply.

Each answer must be in lowest terms.

1. $3 \times \frac{2}{5}$

$6 \times \frac{3}{4}$

$4 \times \frac{2}{9}$

$2 \times \frac{3}{8}$

2. $\frac{1}{6} \times 17$

$\frac{7}{8} \times 10$

$\frac{3}{7} \times 2$

$\frac{3}{10} \times 2$

3. $8 \times \frac{1}{4}$

$15 \times \frac{2}{3}$

$\frac{3}{4} \times 16$

$\frac{5}{6} \times 42$

4. $\frac{5}{16} \times 5$

$\frac{11}{12} \times 8$

$5 \times \frac{1}{3}$

$10 \times \frac{5}{8}$

5. $7 \times \frac{2}{15}$

$4 \times \frac{1}{10}$

$\frac{1}{9} \times 5$

$\frac{3}{16} \times 4$

6. $\frac{7}{12} \times 96$

$\frac{3}{7} \times 13$

$12 \times \frac{3}{16}$

$13 \times \frac{6}{7}$

7. $9 \times \frac{2}{25}$

$21 \times \frac{6}{7}$

$\frac{7}{20} \times 2$

$\frac{5}{8} \times 64$

8. $\frac{7}{10} \times 90$

$14 \times \frac{1}{16}$

$\frac{3}{25} \times 4$

$\frac{9}{16} \times 6$

9. There are 36 pupils in Miss Smith's Grade VI class. If $\frac{2}{3}$ of the pupils are boys, how many boys are there in Miss Smith's class?

10. If a package of jelly powder weighs $\frac{3}{16}$ lb., how much will 4 packages weigh?

MULTIPLYING A MIXED NUMBER BY A WHOLE NUMBER

Mr. Dyke was repairing his fence. He bought 6 cross-bars each of which was $12\frac{3}{4}$ ft. long. How far would the cross-bars reach if they were placed end to end?

To find how far they would reach we *multiply* $12\frac{3}{4}$ by 6.

Write the numbers as shown.

$$\begin{array}{r} 12\frac{3}{4} \\ 6 \\ \hline 4\frac{1}{2} \\ 72 \\ \hline 76\frac{1}{2} \end{array}$$

(1) Multiply $\frac{3}{4}$ by 6.

$$6 \times \frac{3}{4} = \frac{18}{4} = 4\frac{2}{4} = 4\frac{1}{2}$$

Write the $4\frac{1}{2}$ with $\frac{1}{2}$ under $\frac{3}{4}$

(2) Multiply 12 by 6.

$$6 \times 12 = 72$$

Write the 72 as shown.

(3) Add $4\frac{1}{2}$ and 72

So the 6 cross-bars would reach $76\frac{1}{2}$ ft.

Tell how this is done

$$\begin{array}{r} 24\frac{1}{2} \\ 8 \\ \hline 4 \\ 192 \\ \hline 196 \end{array}$$

Multiply.

Each answer must be in lowest terms.

- | | | | | |
|---|--|---|---|---|
| 1. $\begin{array}{r} 4\frac{1}{2} \\ 3 \\ \hline \end{array}$ | 2. $\begin{array}{r} 6\frac{2}{3} \\ 5 \\ \hline \end{array}$ | 3. $\begin{array}{r} 7\frac{9}{10} \\ 2 \\ \hline \end{array}$ | 4. $\begin{array}{r} 8\frac{3}{5} \\ 4 \\ \hline \end{array}$ | 5. $\begin{array}{r} 9\frac{5}{8} \\ 6 \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 5\frac{1}{4} \\ 8 \\ \hline \end{array}$ | 3. $\begin{array}{r} 9\frac{4}{5} \\ 5 \\ \hline \end{array}$ | 4. $\begin{array}{r} 11\frac{1}{3} \\ 9 \\ \hline \end{array}$ | 5. $\begin{array}{r} 18\frac{1}{4} \\ 4 \\ \hline \end{array}$ | 6. $\begin{array}{r} 16\frac{5}{6} \\ 12 \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 7\frac{2}{5} \\ 2 \\ \hline \end{array}$ | 4. $\begin{array}{r} 8\frac{5}{16} \\ 3 \\ \hline \end{array}$ | 5. $\begin{array}{r} 6\frac{1}{8} \\ 4 \\ \hline \end{array}$ | 6. $\begin{array}{r} 9\frac{1}{12} \\ 3 \\ \hline \end{array}$ | 7. $\begin{array}{r} 18\frac{7}{16} \\ 2 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 10\frac{3}{16} \\ 8 \\ \hline \end{array}$ | 5. $\begin{array}{r} 9\frac{1}{15} \\ 7 \\ \hline \end{array}$ | 6. $\begin{array}{r} 23\frac{4}{7} \\ 3 \\ \hline \end{array}$ | 7. $\begin{array}{r} 31\frac{3}{20} \\ 5 \\ \hline \end{array}$ | 8. $\begin{array}{r} 13\frac{5}{12} \\ 6 \\ \hline \end{array}$ |
| 5. $\begin{array}{r} 34\frac{4}{15} \\ 3 \\ \hline \end{array}$ | 6. $\begin{array}{r} 26\frac{7}{10} \\ 30 \\ \hline \end{array}$ | 7. $\begin{array}{r} 47\frac{3}{8} \\ 16 \\ \hline \end{array}$ | 8. $\begin{array}{r} 42\frac{3}{4} \\ 20 \\ \hline \end{array}$ | 9. $\begin{array}{r} 35\frac{5}{6} \\ 24 \\ \hline \end{array}$ |

6. On a 5 hour automobile trip Mr. Collins drove his car at an average speed of $36\frac{1}{2}$ miles an hour. How many miles did he travel on the trip?

MULTIPLYING A WHOLE NUMBER BY A MIXED NUMBER

Mrs. Evans bought a $5\frac{3}{8}$ lb. chicken at the market. If the chicken cost 48¢ a pound, how much did she pay for it?

To find out we multiply 48 by $5\frac{3}{8}$

Write the numbers as shown.

$$\begin{array}{r} 48\text{¢} \\ 5\frac{3}{8} \\ \hline 18 \\ 240 \\ \hline 258\text{¢} \end{array}$$

(1) Multiply 48 by $\frac{3}{8}$.

$$\frac{3}{8} \times 48 = \frac{144}{8} = 18.$$

Write the 18 as shown.

(2) Multiply 48 by 5.

$$5 \times 48 = 240.$$

Write the 240 as shown.

(3) Add 18 and 240

Tell how this is done

$$\begin{array}{r} 26 \\ 3\frac{1}{4} \\ \hline 6\frac{1}{2} \\ 78 \\ \hline 84\frac{1}{2} \end{array}$$

So she paid 258¢ or \$2.58 for the chicken.

Multiply.

Each answer must be in lowest terms.

- | | | | | |
|--|---|---|---|--|
| 1. $\begin{array}{r} 9 \\ 4\frac{1}{3} \\ \hline \end{array}$ | 6 $\begin{array}{r} 2\frac{1}{2} \\ \hline \end{array}$ | 12 $\begin{array}{r} 3\frac{1}{6} \\ \hline \end{array}$ | 8 $\begin{array}{r} 5\frac{3}{4} \\ \hline \end{array}$ | 10 $\begin{array}{r} 7\frac{4}{5} \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 7 \\ 3\frac{1}{4} \\ \hline \end{array}$ | 9 $\begin{array}{r} 6\frac{2}{5} \\ \hline \end{array}$ | 18 $\begin{array}{r} 7\frac{3}{8} \\ \hline \end{array}$ | 30 $\begin{array}{r} 4\frac{4}{9} \\ \hline \end{array}$ | 8 $\begin{array}{r} 9\frac{5}{12} \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 8 \\ 3\frac{1}{16} \\ \hline \end{array}$ | 5 $\begin{array}{r} 4\frac{1}{6} \\ \hline \end{array}$ | 2 $\begin{array}{r} 5\frac{3}{8} \\ \hline \end{array}$ | 6 $\begin{array}{r} 8\frac{2}{15} \\ \hline \end{array}$ | 3 $\begin{array}{r} 9\frac{5}{16} \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 24 \\ 2\frac{5}{8} \\ \hline \end{array}$ | 16 $\begin{array}{r} 2\frac{2}{3} \\ \hline \end{array}$ | 2 $\begin{array}{r} 8\frac{3}{10} \\ \hline \end{array}$ | 13 $\begin{array}{r} 5\frac{7}{16} \\ \hline \end{array}$ | 50 $\begin{array}{r} 6\frac{7}{10} \\ \hline \end{array}$ |
| 5. $\begin{array}{r} 35 \\ 8\frac{6}{7} \\ \hline \end{array}$ | 22 $\begin{array}{r} 6\frac{3}{10} \\ \hline \end{array}$ | 12 $\begin{array}{r} 7\frac{1}{20} \\ \hline \end{array}$ | 36 $\begin{array}{r} 7\frac{4}{7} \\ \hline \end{array}$ | 34 $\begin{array}{r} 3\frac{11}{16} \\ \hline \end{array}$ |

6. Mrs. Lewis ordered $2\frac{1}{2}$ lb. of sausages at 52¢ a pound. How much did she pay for the sausages?

7. Ruth's mother bought $5\frac{3}{4}$ yd. of cloth at 84¢ a yard. How much change did she get from a \$5 bill?

SALES SLIPS

Every Saturday, Norman works at Green's Grocery Store. He waits on customers, takes orders over the telephone, and puts up the orders for the delivery man. When he takes an order that is to be delivered he makes out a *sales slip*. One

copy of the sales slip goes to the customer with the order, and a carbon copy of it is kept at the store.

When Mrs. Little telephoned, Norman took her order, put up the order, and made out the sales slip on the left.

First, he wrote in the date and the name and address of the customer, Mrs. R. S. Little.

Below he listed the amount of each article ordered, the price of each article per pound, per

GREEN'S GROCERY HOME OF GOOD FOOD TELEPHONE 206			
Ogden, N.S. <u>May 2, 1956</u>			
Mrs. R. S. Little			
Address <u>14 Elm St.</u>			
2	lb. ham @ 61c.	1	22
1	lb. tea @ 95c.		95
1½	lb. haddock @ 34c.		51
1	doz. eggs @ 58c.		58
	<i>Paid Green's Grocery A.R.P.</i>	3	26

doz., etc., and the total cost of each article, which is shown on the right. Then he found the total amount owed (\$3.26) by adding the total costs of the articles ordered. The sign @ shown on the sales slip means "at".

Norman put the articles ordered and the customer's copy of the sales slip in a carton and sent the order to Mrs. Little.

When it was delivered Mrs. Little paid the delivery man, who receipted the bill as shown, adding his own initials, A.R.P., to show that he received the money for the order.

Rule a sales slip like the one above for each of the orders below. Fill in each sales slip. Receipt each slip.

1. On June 8, Mrs. A. L. Mahon ordered 3 lb. tomatoes @ 21¢ a lb.; 2 lb. sausages @ 49¢ a lb.; 2½ lb. butter @ 68¢ a lb.; and 1 jar strawberry jam @ 46¢ a jar.

2. On August 19, Mrs. T. R. Jones ordered 4 cans of peas @ 13¢ a can; 1½ lb. roast beef @ 48¢ a lb.; 2 cakes of soap @ 12¢ a cake; and 2 doz. oranges @ 43¢ a doz.

MONTHLY BILLS

When a customer has a *charge account* he receives a bill at the end of the month for all the purchases he made during the month. Telephone companies, and electric light or gas companies send out bills every month also.

Mr. Edwards buys everything he needs for his automobile from the Blue Jay Motor Co. He received the bill below for his purchases during the month of April.

BLUE JAY MOTOR COMPANY SCOON LAKE, N.B.					
<i>Mr. P. N. Edwards</i> <i>161 Adams Rd.,</i> <i>Scoon Lake, N.B.</i>			<i>April 30, 1956</i>		
April	4	6 gal. gasoline @ 41c.	2	46	
"	5	5 qt. motor oil @ 45c.	2	25	
"	12	Repair to fender	8	71	
"	19	8 gal. gasoline @ 41c.	3	28	
"	27	4 gal. gasoline @ 41c.	1	64	
			18		34

Received payment
 May 3/56
 S.L.M.

The monthly bill above, sent out from the office of the Blue Jay Motor Co., shows the date the bill was made out, and the name and address of the customer, Mr. Edwards. Then there is a statement showing the date of each purchase. The total amount of the bill is found by adding the individual amounts.

When Mr. Edwards paid the bill on May 3 the bill was receipted and the initials of the one who received the payment are shown. Mr. Edwards will keep the receipted bill in a safe place.

Rule a form like the above for account below.

1. Mrs. O. M. Wilson bought the following from Norton's Ltd. May 4, 2 yd. ribbon @ 9¢ a yd. and 1 pair of gloves @ \$3.75; May 9, 6½ yd. cloth @ 72¢ a yd.; May 15, 1 girl's dress @ \$8.40; May 27, 3 pr. stockings @ \$1.19 a pair.

The bill was paid on June 3. Receipt the bill.

PRACTICE IN ADDITION AND SUBTRACTION OF FRACTIONS WITH UNLIKE DENOMINATORS

Add and check.

Each answer must be in lowest terms.

1. $\frac{1}{2} + \frac{1}{3} = \frac{3}{4}$ $\frac{3}{8} + \frac{2}{3} = \frac{5}{8}$ $\frac{5}{8} + \frac{7}{12} = \frac{2}{5}$
 $\frac{1}{10} + \frac{1}{5} = \frac{1}{6}$ $\frac{7}{16} + \frac{1}{8} = \frac{1}{6}$ $\frac{1}{9} + \frac{5}{12} = \frac{11}{12}$
2. $\frac{1}{3} + \frac{5}{6} = \frac{3}{5}$ $\frac{5}{6} + \frac{1}{2} = \frac{3}{4}$ $\frac{3}{10} + \frac{11}{12} = \frac{7}{8}$
 $\frac{7}{8} + \frac{5}{12} = \frac{3}{4}$ $\frac{2}{9} + \frac{11}{15} = \frac{7}{16}$ $\frac{7}{8} + \frac{11}{10} = \frac{7}{10}$
3. $5\frac{1}{3} + 3\frac{1}{4} = 6\frac{3}{8}$ $8\frac{3}{10} + 4\frac{1}{6} = 9\frac{5}{6}$ $9\frac{5}{8} + 8\frac{1}{5} = 8\frac{1}{5}$
 $4\frac{5}{12} + 7\frac{2}{3} = 9\frac{5}{12}$ $3\frac{2}{5} + 7\frac{2}{5} = 10\frac{4}{5}$ $8\frac{1}{15} + 9\frac{5}{6} = 16\frac{5}{6}$
4. $1\frac{7}{9} + 8\frac{4}{5} = 12\frac{7}{10}$ $13\frac{11}{16} + 14\frac{5}{6} = 27\frac{5}{6}$ $16\frac{5}{8} + 8\frac{3}{5} = 24\frac{4}{5}$
 $6\frac{1}{4} + 2\frac{9}{10} = 8\frac{13}{20}$ $7\frac{1}{2} + 6\frac{7}{8} = 13\frac{11}{8}$ $8\frac{3}{5} + 16\frac{5}{6} = 24\frac{4}{5}$
5. $2\frac{1}{8} + 5\frac{1}{2} = 7\frac{3}{4}$ $1\frac{2}{3} + 9\frac{3}{8} = 10\frac{17}{24}$ $11\frac{1}{3} + 20\frac{4}{5} = 31\frac{11}{15}$
 $1\frac{1}{2} + 4\frac{3}{4} = 6\frac{1}{4}$ $6\frac{5}{6} + 3\frac{4}{5} = 10\frac{11}{30}$ $15\frac{7}{12} + 6\frac{3}{10} = 21\frac{11}{20}$
 $3\frac{1}{4} + 2\frac{1}{3} = 5\frac{5}{12}$ $3\frac{5}{12} + 4\frac{1}{4} = 7\frac{1}{3}$ $19\frac{1}{2} + 6\frac{3}{10} = 25\frac{11}{10}$

Subtract and check.

Each answer must be in lowest terms.

6. $\frac{1}{2} - \frac{2}{3} = \frac{5}{6}$ $\frac{13}{16} - \frac{7}{8} = \frac{5}{16}$ $\frac{9}{10} - \frac{4}{5} = \frac{1}{10}$
 $\frac{3}{8} - \frac{1}{4} = \frac{1}{8}$ $\frac{3}{4} - \frac{1}{3} = \frac{5}{12}$ $\frac{5}{8} - \frac{1}{6} = \frac{11}{24}$
7. $4\frac{2}{3} - 9\frac{1}{2} = -5\frac{1}{6}$ $8\frac{11}{12} - 10\frac{3}{8} = -2\frac{1}{6}$ $14\frac{7}{8} - 17\frac{3}{4} = -3\frac{1}{4}$
 $2\frac{1}{12} - 3\frac{2}{5} = -1\frac{11}{30}$ $4\frac{5}{6} - 2\frac{1}{6} = 2\frac{4}{6} = 1\frac{2}{3}$ $6\frac{4}{5} - 8\frac{7}{10} = -2\frac{1}{10}$
8. $5\frac{1}{3} - 6\frac{3}{8} = -1\frac{5}{24}$ $9\frac{1}{5} - 4\frac{1}{6} = 5\frac{1}{30}$ $7\frac{1}{3} - 11\frac{5}{12} = -4\frac{1}{4}$
 $1\frac{3}{4} - 3\frac{5}{6} = -2\frac{1}{12}$ $7\frac{9}{10} - 3\frac{7}{9} = 4\frac{11}{90}$ $2\frac{7}{8} - 6\frac{3}{4} = -3\frac{1}{4}$
9. $3\frac{1}{4} - 8\frac{3}{10} = -5\frac{11}{20}$ $10\frac{3}{4} - 12\frac{1}{16} = -1\frac{1}{8}$ $13\frac{3}{10} - 14\frac{3}{5} = -1\frac{1}{10}$
 $2\frac{3}{8} - 5\frac{2}{3} = -3\frac{1}{24}$ $4\frac{5}{6} - 8\frac{1}{2} = -3\frac{1}{3}$ $5\frac{3}{8} - 8\frac{5}{6} = -3\frac{1}{24}$
10. $9\frac{3}{5} - 11\frac{1}{3} = -2\frac{2}{15}$ $15\frac{1}{5} - 18\frac{7}{12} = -3\frac{11}{20}$ $12\frac{5}{8} - 8\frac{1}{6} = 4\frac{11}{24}$
 $4\frac{3}{4} - 3\frac{5}{6} = 1\frac{1}{12}$ $6\frac{1}{2} - 9\frac{7}{8} = -2\frac{5}{8}$ $6\frac{11}{16} - 7\frac{7}{10} = -1\frac{11}{80}$

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	7442	9550	5165	4741	6677
	8983	3286	9806	3773	1425
	4010	7493	3588	1570	6879
	3103	5855	7117	5932	4934
	9071	9372	9802	7410	7676
	<u>4340</u>	<u>2060</u>	<u>6926</u>	<u>8801</u>	<u>1502</u>

Subtract. Check each exercise.

2.	53485	17463	77324	48600	51512
	<u>48780</u>	<u>13947</u>	<u>68986</u>	<u>39537</u>	<u>46975</u>
3.	26103	40400	83489	74525	36346
	<u>17598</u>	<u>10061</u>	<u>32629</u>	<u>48666</u>	<u>27959</u>
4.	98364	84582	31151	96283	43254
	<u>28627</u>	<u>57594</u>	<u>15759</u>	<u>68984</u>	<u>38798</u>

Multiply. Check each answer.

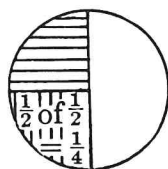
5.	2574	1698	5039	2708	1657
	<u>3</u>	<u>5</u>	<u>8</u>	<u>6</u>	<u>9</u>
6.	74	68	718	2305	1074
	<u>50</u>	<u>27</u>	<u>15</u>	<u>39</u>	<u>68</u>
7.	432	608	852	681	974
	<u>317</u>	<u>259</u>	<u>600</u>	<u>180</u>	<u>406</u>
					<u>785</u>
					<u>709</u>

Divide. Check each exercise.

8.	62)25854	53)19359	29)12364	48)35246
9.	25)9375	17)10995	34)8840	76)15671
10.	163)57702	428)81074	392)115460	

THE MEANING OF MULTIPLYING A FRACTION BY A FRACTION

The whole circle on the right is divided into halves by the long line, the diameter. Then the half on the left is divided into halves so that each part is $\frac{1}{4}$ of the whole circle.

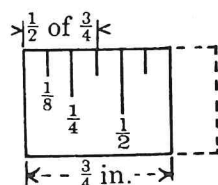


Notice that $\frac{1}{2}$ of $\frac{1}{2} = \frac{1}{4}$.

In arithmetic "of" means $\times$.

So, $\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

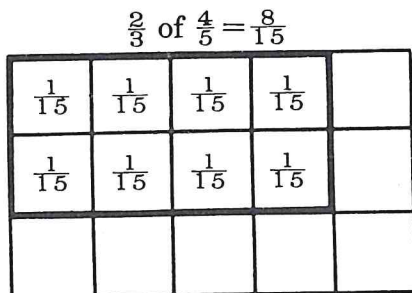
The whole inch on the right is divided into halves, fourths, and eighths. The heavily marked part is $\frac{3}{4}$ of an inch. At the top $\frac{1}{2}$ of $\frac{3}{4}$ is marked off.



Notice that $\frac{1}{2}$ of $\frac{3}{4} = \frac{3}{8}$.

So, $\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

The rectangle on the right is divided into 5 equal parts by the long vertical lines; and into 3 equal parts by the long horizontal lines. The whole rectangle is divided into 15 equal parts so that each part is $\frac{1}{15}$ of the whole rectangle.



Point out $\frac{4}{5}$ of the whole rectangle. Notice that $\frac{4}{5}$ of the rectangle is divided into 3 equal parts by horizontal lines, so that the heavily marked rectangle is $\frac{2}{3}$ of $\frac{4}{5}$ of the whole rectangle.

Notice that $\frac{2}{3}$ of $\frac{4}{5} = \frac{8}{15}$

So, $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$

Study each of the three blocks above to see if you can discover a rule for multiplying a fraction by a fraction.

Rule. To multiply a fraction by a fraction multiply the numerators of the fractions to get a new numerator, and multiply the denominators to get a new denominator.

MULTIPLYING A FRACTION BY A FRACTION

Charlie dug $\frac{3}{8}$ of a bushel of potatoes from the garden. If he sold $\frac{2}{3}$ of them, what part of a bushel did he sell?

To find what part of a bushel he sold *multiply* $\frac{3}{8}$ by $\frac{2}{3}$.

$$\frac{2}{3} \times \frac{3}{8} = \frac{6}{24} = \frac{1}{4}$$

(1) Multiply the numerators to get a new numerator. $2 \times 3 = 6$.

(2) Multiply the denominators to get a new denominator. $3 \times 8 = 24$.

Change $\frac{6}{24}$ to $\frac{1}{4}$

So Charlie sold $\frac{1}{4}$ of a bushel of potatoes.

Multiply. Each answer must be in lowest terms.

1. $\frac{1}{2} \times \frac{1}{3}$

$\frac{1}{2} \times \frac{3}{4}$

$\frac{2}{3} \times \frac{2}{5}$

$\frac{3}{5} \times \frac{3}{4}$

2. $\frac{2}{3} \times \frac{5}{6}$

$\frac{7}{8} \times \frac{4}{5}$

$\frac{9}{10} \times \frac{5}{8}$

$\frac{4}{7} \times \frac{7}{12}$

3. $\frac{1}{6} \times \frac{4}{9}$

$\frac{3}{4} \times \frac{3}{8}$

$\frac{5}{9} \times \frac{3}{10}$

$\frac{9}{16} \times \frac{2}{3}$

4. $\frac{2}{5} \times \frac{1}{2}$

$\frac{3}{10} \times \frac{5}{6}$

$\frac{6}{7} \times \frac{7}{12}$

$\frac{5}{12} \times \frac{3}{4}$

5. $\frac{15}{16} \times \frac{4}{5}$

$\frac{1}{3} \times \frac{7}{8}$

$\frac{3}{8} \times \frac{2}{3}$

$\frac{4}{5} \times \frac{1}{6}$

6. $\frac{5}{6} \times \frac{4}{5}$

$\frac{11}{12} \times \frac{2}{3}$

$\frac{8}{9} \times \frac{3}{16}$

$\frac{14}{15} \times \frac{5}{7}$

7. $\frac{1}{4} \times \frac{1}{2}$

$\frac{5}{6} \times \frac{3}{15}$

$\frac{2}{3} \times \frac{3}{10}$

$\frac{4}{7} \times \frac{7}{8}$

8. $\frac{3}{10} \times \frac{5}{12}$

$\frac{9}{16} \times \frac{2}{3}$

$\frac{3}{5} \times \frac{5}{9}$

$\frac{7}{10} \times \frac{4}{5}$

9. Elsie had a $\frac{1}{2}$ lb. bag of chocolates. She gave $\frac{1}{3}$ of them to Jean. What part of a pound of chocolates did she give to Jean?

10. When Joe came home from school he found $\frac{3}{4}$ doz. doughnuts in a jar in the pantry. If Joe and his friends ate $\frac{1}{3}$ of the doughnuts, what part of a dozen did they eat?

11. Tom lives $\frac{7}{8}$ mi. from school. Every day, after school, he runs $\frac{1}{2}$ of the way home. What part of a mile does he run?



PROBLEMS USING MULTIPLICATION OF FRACTIONS

1. Tommy knows that he must drink milk to grow tall and strong. If he drinks $\frac{3}{4}$ of a quart of milk a day, how many quarts does he drink in a month of 30 days?

2. If chocolates cost 48¢ a pound, how much will Helen pay for $\frac{5}{8}$ of a pound?

3. The net weight of a package of corn meal is $2\frac{1}{4}$ lb. What is the net weight of 8 packages?

4. Jean had $\frac{3}{4}$ yd. of flannelette. She used $\frac{2}{3}$ of it to make a coat for her puppy. How much of a yard of flannelette did the puppy's coat take?

5. Mrs. Robins bought $3\frac{1}{2}$ doz. oranges yesterday. How much did she pay for them if they cost 40¢ a dozen?

6. Tony raises chickens for sale. Last Saturday he sold 4 chickens. If the average weight of the chickens was $5\frac{3}{8}$ lb., how much did the chickens weigh altogether?

7. Last summer Roy earned pocket money by doing odd jobs. One day he helped Mr. Green repair his fences. If Roy worked $7\frac{1}{2}$ hr. and was paid 30¢ an hour, how much did he earn that day?

8. Elsie lives $\frac{9}{10}$ of a mile from the post office. Alice lives $\frac{2}{3}$ that far from the post office. How far does Alice live from the post office?

CANCELLATION

Susan had $\frac{1}{6}$ of a yard of Scotch tape. She used $\frac{4}{5}$ of it to bind a book. What part of a yard did she use?

To find out how much of a yard she used we find $\frac{4}{5}$ of $\frac{1}{6}$ by multiplying $\frac{4}{5}$ by $\frac{1}{6}$

Long way $\Rightarrow$

$$\frac{1}{6} \times \frac{4}{5} = \frac{4}{30} = \frac{2}{15}$$

So she used $\frac{2}{15}$ of a yard.

Notice that *after* we multiplied the fractions we had to change $\frac{4}{30}$ to lowest terms, $\frac{2}{15}$, by dividing both the numerator, 4, and the denominator, 30 by 2.

Often we can shorten our work by *dividing* before we multiply. This is called *cancellation*,

Short way $\Rightarrow$

$$\frac{1}{\cancel{6}_3} \times \frac{\overset{2}{\cancel{4}}}{5} = \frac{2}{15}$$

Before we multiplied we divided both a numerator, 4, and a denominator, 6, by the same number, 2. The numbers we divided are *cancelled* or crossed out. The new numerator, 2, is written above the 4; and the new denominator, 3, is written below the 6. Then the numerators are multiplied and the denominators are multiplied giving the answer $\frac{2}{15}$.

When cancellation is used in multiplying fractions divide a numerator and a denominator by the same number. Use the largest number that will divide evenly into both.

Sometimes we can cancel more than once.

Tell how this is done $\Rightarrow$

$$\frac{\overset{1}{\cancel{2}}}{\underset{1}{\cancel{2}}} \times \frac{\overset{1}{\cancel{2}}}{\underset{2}{\cancel{4}}} = \frac{1}{2}$$

A whole number may be written as a fraction with 1 as the denominator. $12 = \frac{12}{1}$ $12 \times \frac{3}{8} = \frac{12}{1} \times \frac{3}{8}$

Tell how this is done $\Rightarrow$

$$\frac{\overset{3}{\cancel{12}}}{1} \times \frac{3}{\underset{2}{\cancel{8}}} = \frac{9}{2} = 4\frac{1}{2}$$

MULTIPLYING FRACTIONS

Multiply. Cancel when possible.

- | | | | |
|--|--|--|--|
| 1. $\frac{2}{3} \times \frac{5}{8}$ | 2. $\frac{5}{6} \times \frac{3}{4}$ | 3. $\frac{1}{2} \times \frac{2}{9}$ | 4. $\frac{3}{5} \times \frac{1}{4}$ |
| 5. $\frac{3}{4} \times \frac{8}{9}$ | 6. $\frac{3}{8} \times \frac{1}{5}$ | 7. $\frac{4}{9} \times \frac{3}{16}$ | 8. $\frac{9}{20} \times \frac{5}{6}$ |
| 9. $6 \times \frac{3}{4}$ | 10. $15 \times \frac{7}{10}$ | 11. $8 \times \frac{3}{5}$ | 12. $20 \times \frac{7}{8}$ |
| 13. $\frac{1}{3} \times 18$ | 14. $\frac{9}{16} \times 12$ | 15. $\frac{7}{12} \times 8$ | 16. $\frac{3}{7} \times 13$ |
| 17. $\frac{5}{7} \times \frac{3}{10}$ | 18. $\frac{8}{15} \times \frac{5}{12}$ | 19. $3 \times \frac{7}{16}$ | 20. $\frac{4}{5} \times 35$ |
| 21. $\frac{2}{3} \times \frac{15}{16}$ | 22. $\frac{9}{10} \times \frac{1}{3}$ | 23. $\frac{11}{12} \times \frac{2}{5}$ | 24. $\frac{14}{15} \times \frac{3}{7}$ |
| 25. $\frac{5}{16} \times \frac{4}{15}$ | 26. $\frac{1}{6} \times 21$ | 27. $\frac{1}{12} \times \frac{8}{9}$ | 28. $11 \times \frac{2}{5}$ |
| 29. $\frac{1}{3} \times \frac{6}{7}$ | 30. $\frac{9}{16} \times \frac{2}{3}$ | 31. $\frac{3}{12} \times \frac{4}{9}$ | 32. $\frac{3}{10} \times 25$ |
| 33. $4 \times \frac{1}{6}$ | 34. $\frac{5}{8} \times \frac{7}{10}$ | 35. $\frac{3}{4} \times 4$ | 36. $\frac{4}{15} \times \frac{9}{10}$ |

10. Tom studies his history lesson $\frac{3}{4}$ hr. each day. How many hours does Tom study history in 10 days?

11. Tilly's mother bought $\frac{3}{8}$ gal. of ice-cream for Tilly's birthday party. She served $\frac{2}{3}$ of the ice-cream to Tilly's friends. What part of a gallon did she serve?

12. Elsie had $\frac{5}{6}$ yd. of lace. She used $\frac{3}{4}$ of it to trim her doll's dress. What part of a yard did she use?

Cancellation may be used to change a fraction to lowest terms.

Tell how these are done $\Rightarrow$ $\frac{8}{24} = \frac{1}{3}$ and $\frac{10}{25} = \frac{2}{5}$

Change the fractions below to lowest terms by cancelling.

13. $\frac{4}{8}, \frac{10}{12}, \frac{6}{18}, \frac{16}{20}, \frac{10}{15}, \frac{8}{10}, \frac{16}{32}, \frac{25}{40}$

MULTIPLYING FRACTIONS AND MIXED NUMBERS

The gasoline tank in Mr. Dow's car holds $8\frac{1}{4}$ gal. How many gallons are there in the tank when it is $\frac{2}{3}$ full? To find how many gallons are in the tank, we find $\frac{2}{3}$ of $8\frac{1}{4}$ gal. by multiplying $8\frac{1}{4}$ by $\frac{2}{3}$.

$$\frac{2}{3} \times 8\frac{1}{4} = \frac{2}{3} \times \frac{33}{4} = \frac{11}{2} = 5\frac{1}{2}$$

Change $8\frac{1}{4}$ to the improper fraction $\frac{33}{4}$.

Cancel and multiply.

Change $\frac{11}{2}$ to $5\frac{1}{2}$

So there are $5\frac{1}{2}$ gal. in the tank.

Rule. When multiplying fractions and mixed numbers, change the mixed number to an improper fraction before multiplying.

Multiply. Cancel when possible. Each answer must be in lowest terms.

1. $2\frac{1}{2} \times \frac{3}{4}$

$\frac{5}{6} \times 3\frac{1}{2}$

$2\frac{2}{9} \times \frac{2}{5}$

$\frac{7}{12} \times 5\frac{1}{4}$

2. $\frac{1}{8} \times 4\frac{1}{2}$

$1\frac{3}{4} \times \frac{5}{12}$

$3\frac{1}{3} \times \frac{1}{4}$

$\frac{5}{16} \times 1\frac{3}{10}$

3. $\frac{5}{12} \times 2\frac{2}{5}$

$6\frac{2}{3} \times \frac{3}{10}$

$4\frac{3}{5} \times \frac{2}{3}$

$\frac{2}{5} \times 6\frac{1}{4}$

4. $1\frac{1}{3} \times \frac{9}{10}$

$2\frac{1}{2} \times \frac{3}{16}$

$\frac{5}{6} \times 1\frac{1}{5}$

$1\frac{3}{5} \times \frac{5}{16}$

5. $\frac{3}{8} \times 5\frac{2}{5}$

$7\frac{7}{10} \times \frac{5}{8}$

$1\frac{1}{3} \times \frac{2}{5}$

$\frac{2}{7} \times 4\frac{2}{3}$

6. $1\frac{1}{3} \times \frac{7}{8}$

$\frac{7}{8} \times 3\frac{3}{7}$

$\frac{3}{20} \times 3\frac{8}{9}$

$3\frac{1}{5} \times 1\frac{1}{12}$

7. $\frac{5}{6} \times 1\frac{5}{7}$

$3\frac{1}{3} \times \frac{4}{5}$

$\frac{7}{16} \times 2\frac{2}{3}$

$2\frac{6}{7} \times \frac{7}{8}$

8. The Donaldson children picked $3\frac{1}{2}$ gal. of blueberries one day last summer. Their mother canned $\frac{3}{4}$ of them for winter use. How many gallons of blueberries did she can?

9. The night before Mary was to write examinations, she studied for $2\frac{1}{2}$ hr. If she studied History for $\frac{2}{3}$ of the time, how long did she study History?

MULTIPLYING MIXED NUMBERS

On a fast hike the Boy Scout troop averaged $3\frac{1}{2}$ mi. an hour.
At the same rate how far would they travel in $2\frac{2}{3}$ hr.?

To find how far they would travel we *multiply* $3\frac{1}{2}$ by $2\frac{2}{3}$.

Change $2\frac{2}{3}$ to $\frac{8}{3}$ and $3\frac{1}{2}$ to $\frac{7}{2}$

Cancel and multiply.

Change $\frac{28}{8}$ to $9\frac{1}{3}$

So they would travel $9\frac{1}{3}$ mi.

$$2\frac{2}{3} \times 3\frac{1}{2} = \frac{8}{3} \times \frac{7}{2} = \frac{28}{3} = 9\frac{1}{3}$$

Rule. When multiplying mixed numbers, change the mixed numbers to improper fractions before multiplying.

Multiply. Cancel when possible. Each answer must be in lowest terms.

- | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|
| 1. $2\frac{1}{4} \times 4\frac{1}{2}$ | $2\frac{1}{2} \times 1\frac{2}{5}$ | $6\frac{1}{3} \times 1\frac{3}{4}$ | $1\frac{2}{3} \times 2\frac{1}{10}$ |
| 2. $4\frac{4}{5} \times 1\frac{2}{3}$ | $5\frac{1}{4} \times 1\frac{5}{9}$ | $3\frac{3}{4} \times 2\frac{2}{5}$ | $2\frac{5}{6} \times 2\frac{4}{5}$ |
| 3. $2\frac{6}{7} \times 6\frac{1}{8}$ | $1\frac{4}{5} \times 2\frac{2}{3}$ | $2\frac{1}{4} \times 2\frac{2}{3}$ | $1\frac{3}{7} \times 1\frac{1}{20}$ |
| 4. $1\frac{7}{10} \times 6\frac{1}{4}$ | $3\frac{1}{2} \times 2\frac{5}{6}$ | $7\frac{3}{5} \times 1\frac{1}{4}$ | $5\frac{1}{3} \times 2\frac{7}{16}$ |
| 5. $2\frac{1}{3} \times 4\frac{1}{2}$ | $3\frac{3}{16} \times 2\frac{2}{9}$ | $3\frac{3}{4} \times 4\frac{4}{5}$ | $4\frac{1}{12} \times 6\frac{4}{7}$ |
| 6. $8\frac{2}{5} \times 2\frac{11}{12}$ | $9\frac{3}{5} \times 2\frac{1}{12}$ | $2\frac{2}{7} \times 5\frac{3}{8}$ | $7\frac{1}{6} \times 2\frac{1}{5}$ |
| 7. $5\frac{1}{4} \times 2\frac{4}{7}$ | $2\frac{1}{10} \times 8\frac{1}{3}$ | $3\frac{3}{16} \times 1\frac{3}{5}$ | $6\frac{6}{7} \times 2\frac{7}{16}$ |

8. Farmer Gray cut $4\frac{1}{4}$ T. of hay from one of his fields. From a larger field he cut $2\frac{2}{3}$ times as much. How many tons of hay did he cut from the larger field?

9. Ronald can run a mile in $6\frac{3}{4}$ min. If it takes him $3\frac{1}{3}$ times as long to walk a mile, how long will it take him to walk a mile?

10. Jane and her father gathered the eggs at their chicken farm this morning. Jane gathered $3\frac{3}{4}$ doz., and her father gathered $2\frac{2}{5}$ times as many. How many dozen eggs did Jane's father gather?

11. A quart of water weighs $2\frac{1}{2}$ lb. How many pounds do $6\frac{1}{2}$ quarts weigh?



USING FRACTIONS WHEN COOKING

1. Gordon's mother was making Magic Chocolate Pies. She used this recipe: 2 squares of chocolate; $1\frac{1}{3}$ cups of condensed milk; $\frac{1}{2}$ cup of water; $\frac{1}{4}$ teaspoon of salt; $\frac{1}{2}$ teaspoon of vanilla. This recipe will make the filling for one pie. What quantity of each would she use if she mixed enough in one batch to make 6 pies?

2. Dorothy's mother wanted to make Prune-nut Pudding. She used the recipe below:

$\frac{1}{2}$ teaspoon salt	$1\frac{3}{4}$ cups boiling water
$\frac{1}{2}$ cup wheat-meal	1 cup milk
1 egg	$\frac{1}{3}$ cup brown sugar
$\frac{1}{4}$ teaspoon cinnamon	$\frac{1}{8}$ teaspoon ginger
1 cup cooked prunes	$\frac{1}{4}$ cup chopped walnuts

How much of each thing would Dorothy's mother use to make $\frac{1}{2}$ the amount the whole recipe would make?

3. Mrs. Burns uses an electric stove. Her cook book tells her that to roast a fowl takes $\frac{2}{3}$ of a hour per pound. How long will it take to roast a $5\frac{1}{4}$ lb. fowl?

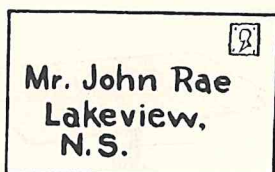
4. Mrs. Terris uses a pressure cooker to cook meats. Her pressure cooker cook book tells her that to cook corn-beef takes $\frac{1}{8}$ of an hour per pound. How long will it take to cook $4\frac{1}{2}$ lb. of corn-beef?

DIAGNOSTIC TEST IN MULTIPLICATION OF FRACTIONS

The work below will test you on the kinds of examples you should know in multiplication of fractions. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

MULTIPLYING WHOLE NUMBERS AND FRACTIONS				Page
1. $4 \times \frac{3}{5}$	$\frac{7}{8} \times 12$	$2 \times \frac{3}{10}$	$\frac{5}{16} \times 3$	101
2. $10 \times \frac{5}{6}$	$\frac{11}{12} \times 7$	$\frac{4}{9} \times 27$	$6 \times \frac{3}{20}$	
MULTIPLYING A MIXED NUMBER BY A WHOLE NUMBER				102
3. $6\frac{1}{3}$ <u>5</u>	$4\frac{7}{12}$ <u>3</u>	$9\frac{5}{8}$ <u>8</u>	$7\frac{1}{10}$ <u>3</u>	
			$8\frac{5}{16}$ <u>2</u>	
MULTIPLYING A WHOLE NUMBER BY A MIXED NUMBER				103
4. 10 <u>$4\frac{1}{2}$</u>	8 <u>$5\frac{2}{3}$</u>	14 <u>$3\frac{3}{4}$</u>	7 <u>$6\frac{1}{12}$</u>	
			3 <u>$9\frac{3}{10}$</u>	
MULTIPLYING A FRACTION BY A FRACTION				109) 112)
5. $\frac{1}{2} \times \frac{5}{6}$	$\frac{3}{5} \times \frac{3}{4}$	$\frac{5}{12} \times \frac{6}{7}$	$\frac{4}{9} \times \frac{1}{8}$	
6. $\frac{7}{10} \times \frac{4}{5}$	$\frac{3}{4} \times \frac{8}{9}$	$\frac{4}{15} \times \frac{3}{16}$	$\frac{2}{3} \times \frac{9}{10}$	
MULTIPLYING FRACTIONS AND MIXED NUMBERS				113
7. $\frac{3}{8} \times 6\frac{1}{2}$	$5\frac{1}{4} \times \frac{3}{7}$	$6\frac{1}{4} \times \frac{9}{10}$	$\frac{1}{12} \times 13\frac{3}{4}$	
8. $2\frac{1}{2} \times \frac{3}{10}$	$\frac{5}{16} \times 13\frac{3}{5}$	$3\frac{3}{7} \times \frac{7}{12}$	$\frac{9}{10} \times 6\frac{2}{3}$	
MULTIPLYING MIXED NUMBERS				114
9. $3\frac{1}{3} \times 2\frac{1}{5}$	$4\frac{1}{2} \times 13\frac{3}{4}$	$2\frac{5}{6} \times 5\frac{1}{4}$	$6\frac{3}{5} \times 1\frac{7}{8}$	
10. $2\frac{1}{12} \times 3\frac{3}{10}$	$21\frac{3}{16} \times 3\frac{1}{5}$	$5\frac{5}{8} \times 1\frac{7}{9}$	$2\frac{7}{10} \times 6\frac{2}{3}$	

THE RECTANGLE



The envelope on the left is shaped like a *rectangle*. Name things in the school room, in your home, and on the street which have the shape of a rectangle.

A rectangle has: (1) *four sides*, (2) *opposite sides which are the same length*, and (3) *four square corners*.

The longer side of a rectangle is called the *length*; the shorter side is called the *width*.

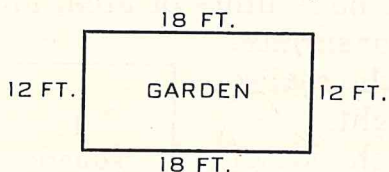
The length and width of the rectangle are called the *dimensions* of the rectangle.

A *square* is a rectangle in which *all four sides are the same length*.

THE PERIMETER OF A RECTANGLE

The distance around a figure of any shape is called its perimeter.

Tony has a flower garden which is 18 ft. long and 12 ft. wide. What is the perimeter of the garden?



The perimeter is found in two ways as shown. Tell how each is done.

18	18
12	+12
18	30
12	×2
60	60

The perimeter of the garden is 60 ft.

1. Mrs. Adams bought a tablecloth 9 ft. long and 6 ft. wide. How many yards of lace will she need to make a border for the tablecloth?

2. What is the perimeter of an out-door rink 30 yd. long and 24 ft. wide?

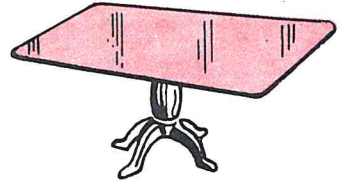
In finding perimeter the dimensions must be in the same unit of measure.

3. How many feet of weather stripping are needed for a window 2 yd. long and 4 ft. wide?

AREA

The Meaning of Area

Mrs. Rae polishes the top of her dining table to keep its *surface* clean and bright.



Another word for surface is *area*. So Mrs. Rae polishes the area of the top of her table. In the same way the top or *surface* of your desk is its *area*; the *surface* of a floor is its *area*; and the *surface* of a wall of your room is its *area*.

Remember:

Area means the amount of surface

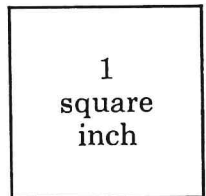
Units of Area

To measure length we have units of length like the inch, foot, yard, etc. *A unit of length must itself have length.* In the same way, to measure capacity we have units of capacity like the cup, pint, quart, etc. *A unit of capacity must itself have capacity.*

So to measure area we must have units of area, and *a unit of area must itself have area or surface.*

The smallest unit of area is the *square inch*. (sq. in.) as shown on the right.

A square inch is a square each side of which is 1 in. long. However, the important thing about a square inch is the amount of surface and not its shape.



The square inch is used to measure small areas.

If you wanted to measure the area of the floor of your classroom it would be more convenient to have a larger unit of area than the square inch. You would use the next largest unit of area, the *square foot* (sq. ft.)

A square foot is a square each of whose sides is 1 foot long.

Draw a square foot on the blackboard.

FINDING THE AREA OF A RECTANGLE

The top of Mrs. Rae's dining room table is shaped like a rectangle 6 ft. long and 4 feet wide. What is the area of the top of the table?

To find out we must find *how many square feet* it will take to cover the top of the table.

1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.	1 sq. ft.

The length of the rectangle (table) is 6 ft., so 6 sq. ft. can be placed in the first row.

The width of the rectangle (table) is 4 ft., so there will be 4 rows.

Hence there are 4 times 6 sq. ft. So the area of the rectangle is 4×6 sq. ft. = 24 sq. ft.

So the area of the top of the table is 24 sq. ft.

Now that you understand how to find the area of a rectangle we can discover a rule to find the area in a shorter way.

Notice that the *number* of units in the length of the rectangle above is 6; and the *number* of units in the width of the rectangle is 4. But $6 \times 4 = 24$. So the number of square units in the area of the rectangle is 24.

Rule: The *number* of square units in the area of a rectangle is found by multiplying the *number* of units in the length by the *number* of units in the width.

Remember that you do not multiply the units. *You multiply the numbers.* The product will be the *number* of square units in the area of the rectangle.

If the length of a rectangle is in inches and the width is in inches the area will be in square inches; if the length and width are in feet the area will be in square feet.

Before multiplying to find the area of a rectangle be sure the length and the width are in the same unit.

FINDING THE AREA OF A RECTANGLE

Tom's mother bought a new rug for the living room. Tom used his foot ruler to measure the length and the width of the rug. If the rug was 12 ft. long and $9\frac{1}{2}$ ft. wide, what was the area of the rug?

To find out Tom multiplied the *number* of feet in the length by the *number* of feet in the width, like this:

$$12 \times 9\frac{1}{2} = 114$$

So the area of the rug was 114 sq. ft.

$ \begin{array}{r} 12 \\ 9\frac{1}{2} \\ \hline 6 \\ 108 \\ \hline 114 \end{array} $
--

Find the areas of rectangles with these dimensions.

1. 10 in. long and 6 in. wide.
2. 16 in. long and 9 in. wide.
3. 32 ft. long and $7\frac{1}{4}$ ft. wide.
4. Each side of a square is 15 in. What is the area of the square?
5. How long is the front blackboard in your classroom? How wide is it? What is the area of the blackboard?
6. The floor of Ann's bedroom is shaped like a square, 11 ft. on each side. How many square feet of linoleum are needed to cover the floor?
7. Mrs. Robbins hooked two mats. One mat was 7 ft. long and 4 ft. wide; the other, 8 ft. long and $3\frac{1}{2}$ ft. wide. Which mat was the larger?
8. Draw a square foot on the blackboard. How many square inches can be put in the first row? How many rows will there be? How many square inches are there in a square foot?

Remember:

$144 \text{ square inches (sq. in.)} = 1 \text{ square foot (sq. ft.)}$

KEEPING THE TOOLS SHARP

Add. Check each exercise.

✓ 1.	\$22.54	\$38.56	\$ 7.61	\$91.45	\$ 8.16
	96.09	50.94	63.47	8.08	97.03
	17.64	34.69	9.06	70.93	59.47
	54.20	10.35	34.79	7.40	4.10
	68.06	85.58	8.07	19.01	47.08
	<u>13.30</u>	<u>90.18</u>	<u>49.52</u>	<u>4.60</u>	<u>9.09</u>

Subtract. Check each exercise.

✓ 2.	62839	86628	55731	35263	54276
	<u>57956</u>	<u>78256</u>	<u>39695</u>	<u>17987</u>	<u>49679</u>
3.	60030	37200	51116	60980	44000
	<u>23983</u>	<u>29559</u>	<u>23968</u>	<u>51092</u>	<u>19271</u>
4.	73003	66252	72734	95381	68038
	<u>60074</u>	<u>59499</u>	<u>35956</u>	<u>55692</u>	<u>42754</u>

Multiply. Check each exercise.

5.	3964	5089	3654	2983	8407
	<u>4</u>	<u>7</u>	<u>6</u>	<u>9</u>	<u>8</u>
✓ 6.	87	73	652	1506	2075
	<u>60</u>	<u>35</u>	<u>28</u>	<u>57</u>	<u>49</u>
✓ 7.	417	604	829	812	968
	<u>237</u>	<u>419</u>	<u>500</u>	<u>670</u>	<u>903</u>
					<u>753</u>
					<u>608</u>

Divide. Check each answer.

✓ 8.	44)10384	72)38497	39)22326	68)43881
9.	54)35567	16)10292	83)20764	24)12078
10.	157)50222	634)92041	483)182653	

KEEPING THE TOOLS SHARP

Add. Each answer must be in lowest terms.

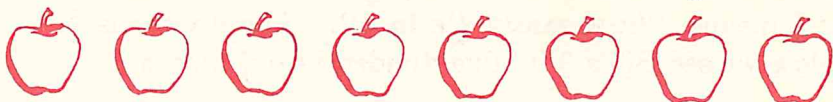
- ✓ 1. $\begin{array}{r} 2\frac{3}{10} \\ 3\frac{7}{10} \end{array}$ $\begin{array}{r} 5\frac{9}{16} \\ 4\frac{11}{16} \end{array}$ $\begin{array}{r} 3\frac{1}{6} \\ 1\frac{1}{2} \end{array}$ $\begin{array}{r} 4\frac{2}{3} \\ 8\frac{4}{9} \end{array}$ $\begin{array}{r} 1\frac{2}{5} \\ 5\frac{5}{8} \end{array}$ $\begin{array}{r} 6\frac{5}{12} \\ 8\frac{2}{3} \end{array}$
- ✓ 2. $\begin{array}{r} 1\frac{7}{8} \\ 6\frac{3}{8} \end{array}$ $\begin{array}{r} 2\frac{9}{10} \\ 9\frac{2}{5} \end{array}$ $\begin{array}{r} 1\frac{2}{5} \\ 1\frac{1}{2} \end{array}$ $\begin{array}{r} 6\frac{3}{4} \\ 4\frac{1}{5} \end{array}$ $\begin{array}{r} 19\frac{5}{6} \\ 6\frac{1}{4} \end{array}$ $\begin{array}{r} 5\frac{3}{10} \\ 15\frac{3}{8} \end{array}$
- ✓ 3. $\begin{array}{r} 7\frac{4}{5} \\ 5\frac{3}{5} \end{array}$ $\begin{array}{r} 6\frac{5}{8} \\ 5\frac{1}{4} \end{array}$ $\begin{array}{r} 7\frac{3}{10} \\ 3\frac{1}{3} \end{array}$ $\begin{array}{r} 13\frac{4}{5} \\ 3\frac{1}{6} \end{array}$ $\begin{array}{r} 4\frac{7}{8} \\ 7\frac{5}{6} \end{array}$ $\begin{array}{r} 9\frac{1}{4} \\ 9\frac{9}{10} \end{array}$
4. $\begin{array}{r} 2\frac{3}{10} \\ 7\frac{1}{2} \end{array}$ $\begin{array}{r} 8\frac{5}{6} \\ 1\frac{7}{24} \end{array}$ $\begin{array}{r} 7\frac{5}{8} \\ 8\frac{1}{10} \end{array}$ $\begin{array}{r} 1\frac{1}{3} \\ 5\frac{3}{5} \end{array}$ $\begin{array}{r} 3\frac{3}{4} \\ 4\frac{7}{20} \end{array}$ $\begin{array}{r} 8\frac{2}{3} \\ 9\frac{3}{8} \end{array}$
5. $\begin{array}{r} 10\frac{3}{16} \\ 2\frac{7}{8} \end{array}$ $\begin{array}{r} 6\frac{1}{2} \\ 2\frac{2}{3} \end{array}$ $\begin{array}{r} 10\frac{7}{10} \\ 1\frac{1}{6} \end{array}$ $\begin{array}{r} 12\frac{1}{6} \\ \frac{1}{8} \end{array}$ $\begin{array}{r} 11\frac{7}{8} \\ 4\frac{1}{3} \end{array}$ $\begin{array}{r} 3\frac{7}{12} \\ 2\frac{7}{10} \end{array}$

Subtract. Each answer must be in lowest terms.

- ✓ 6. $\begin{array}{r} 4\frac{3}{5} \\ 2\frac{1}{5} \end{array}$ $\begin{array}{r} 5\frac{1}{6} \\ 1\frac{5}{6} \end{array}$ $\begin{array}{r} 6 \\ \frac{3}{4} \end{array}$ $\begin{array}{r} 9\frac{1}{2} \\ 5\frac{1}{6} \end{array}$ $\begin{array}{r} 7\frac{15}{16} \\ 4\frac{3}{4} \end{array}$ $\begin{array}{r} 15\frac{1}{2} \\ 8\frac{1}{3} \end{array}$
- ✓ 7. $\begin{array}{r} 8\frac{3}{16} \\ 2\frac{7}{12} \end{array}$ $\begin{array}{r} 5\frac{4}{5} \\ 4\frac{1}{4} \end{array}$ $\begin{array}{r} 2 \\ \frac{7}{10} \end{array}$ $\begin{array}{r} 3\frac{1}{5} \\ 2\frac{3}{4} \end{array}$ $\begin{array}{r} 13\frac{3}{4} \\ 6\frac{1}{6} \end{array}$ $\begin{array}{r} 3 \\ \frac{5}{8} \end{array}$
- ✓ 8. $\begin{array}{r} 10\frac{1}{3} \\ 4\frac{4}{5} \end{array}$ $\begin{array}{r} 9\frac{2}{5} \\ \frac{2}{3} \end{array}$ $\begin{array}{r} 6\frac{5}{6} \\ 4\frac{3}{8} \end{array}$ $\begin{array}{r} 9\frac{2}{3} \\ 2\frac{8}{9} \end{array}$ $\begin{array}{r} 11\frac{1}{4} \\ \frac{7}{16} \end{array}$ $\begin{array}{r} 10\frac{1}{8} \\ 3\frac{7}{10} \end{array}$
9. $\begin{array}{r} 4\frac{3}{10} \\ 3\frac{5}{12} \end{array}$ $\begin{array}{r} 7\frac{1}{6} \\ 6\frac{3}{5} \end{array}$ $\begin{array}{r} 7\frac{11}{12} \\ 3\frac{5}{12} \end{array}$ $\begin{array}{r} 10\frac{3}{8} \\ 5\frac{2}{5} \end{array}$ $\begin{array}{r} 9\frac{2}{5} \\ 6\frac{1}{10} \end{array}$ $\begin{array}{r} 8\frac{3}{16} \\ 4\frac{7}{16} \end{array}$
10. $\begin{array}{r} 3\frac{3}{8} \\ 1\frac{11}{16} \end{array}$ $\begin{array}{r} 12\frac{1}{6} \\ 6\frac{9}{10} \end{array}$ $\begin{array}{r} 14\frac{2}{3} \\ 7\frac{3}{4} \end{array}$ $\begin{array}{r} 8\frac{5}{12} \\ 5\frac{1}{2} \end{array}$ $\begin{array}{r} 16\frac{3}{8} \\ 9\frac{1}{12} \end{array}$ $\begin{array}{r} 5\frac{7}{10} \\ \frac{5}{6} \end{array}$

THE MEANING OF DIVIDING A WHOLE NUMBER BY A FRACTION

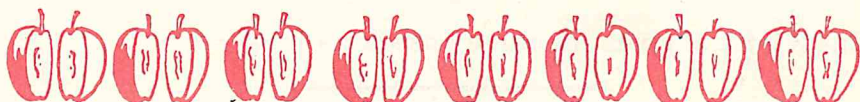
Frank took 8 apples to school. He divided the 8 apples into halves and gave $\frac{1}{2}$ an apple to as many of his friends as he could. How many of Frank's friends got $\frac{1}{2}$ an apple?



If Frank gave 2 apples to each friend we would find how many friends got 2 apples by dividing 8 by 2.

$8 \div 2$ means, "how many 2's in 8", and 2 is the *divisor*.

Below we see Frank's 8 apples divided into $\frac{1}{2}$'s.



To find how many of Frank's friends got $\frac{1}{2}$ an apple we divide 8 by $\frac{1}{2}$, which means "how many $\frac{1}{2}$'s in 8".

How many $\frac{1}{2}$'s in 8 is written, $8 \div \frac{1}{2}$. The divisor is $\frac{1}{2}$.

By counting the $\frac{1}{2}$ apples above we see that $8 \div \frac{1}{2} = 16$.

But $8 \times 2 = 16$ gives the same answer as $8 \div \frac{1}{2} = 16$

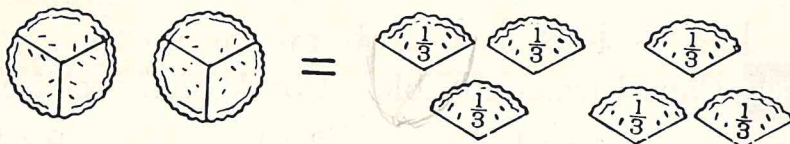
So, $8 \div \frac{1}{2} = 8 \times 2 = 16$

So 16 of Frank's friends got $\frac{1}{2}$ an apple each.

Lena's mother made 2 small pies. If she divided each pie into $\frac{1}{3}$'s, how many $\frac{1}{3}$'s were there?

To find out we must divide 2 by $\frac{1}{3}$. $2 \div \frac{1}{3}$ means, "how many $\frac{1}{3}$'s in 2". The divisor is $\frac{1}{3}$.

Below we see the 2 pies divided into $\frac{1}{3}$'s.



By counting we see that $2 \div \frac{1}{3} = 6$

But $2 \times 3 = 6$ gives the same answer as $2 \div \frac{1}{3} = 6$

So, $2 \div \frac{1}{3} = 2 \times 3 = 6$

So Lena's mother divided the pie into 6 one-thirds.

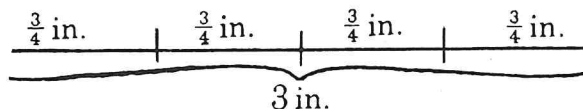
THE MEANING OF DIVIDING A WHOLE NUMBER BY A FRACTION

Bill drew a line 3 in. long in his note-book. How many parts, each $\frac{3}{4}$ in. long can be marked off on this line?

To find out we must divide 3 by $\frac{3}{4}$.

$3 \div \frac{3}{4}$ means, "how many $\frac{3}{4}$'s in 3". The divisor is $\frac{3}{4}$.

Below we see Bill's 3 in. line divided into $\frac{3}{4}$ inches.



By counting we see that $3 \div \frac{3}{4} = 4$.

But $\cancel{3}^1 \times \frac{4}{\cancel{3}_1} = 4$ gives the same answer as $3 \div \frac{3}{4} = 4$

So, $3 \div \frac{3}{4} = \cancel{3}^1 \times \frac{4}{\cancel{3}_1} = 4$

So Frank can mark off 4 parts each $\frac{3}{4}$ in. long.

If we look at the block above and the two blocks on page 123 we see that a division exercise can be changed to a multiplication exercise. When we change the division exercise to a multiplication exercise, we turn the divisor "upside down" or "invert the divisor" before we multiply.

Rule: To divide a whole number by a fraction, invert the divisor and multiply.

Invert each of these fractions.

1. $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{3}{4}, \frac{3}{5}, \frac{5}{6}, \frac{1}{8}, \frac{5}{8}, \frac{1}{10}, \frac{3}{10}, \frac{1}{12}, \frac{3}{16}$

Divide. Cancel when possible. Check each exercise.

2. $5 \div \frac{1}{2}$

$6 \div \frac{1}{4}$

$3 \div \frac{1}{8}$

$9 \div \frac{1}{3}$

3. $9 \div \frac{3}{5}$

$12 \div \frac{3}{4}$

$15 \div \frac{5}{8}$

$24 \div \frac{8}{9}$

4. $3 \div \frac{2}{8}$

$7 \div \frac{3}{4}$

$2 \div \frac{3}{10}$

$4 \div \frac{5}{8}$

5. $6 \div \frac{8}{9}$

$10 \div \frac{4}{7}$

$14 \div \frac{4}{5}$

$12 \div \frac{9}{16}$

DIVIDING A WHOLE NUMBER BY A MIXED NUMBER

The girls in the Glee Club collected \$10 for a present for their teacher. If each girl gave \$ $1\frac{1}{4}$, how many girls were there in the Glee Club?

To find how many girls there were in the Glee Club we must find how many \$ $1\frac{1}{4}$'s there are in \$10. To do this we *divide* 10 by $1\frac{1}{4}$.

$$10 \div 1\frac{1}{4} = 10 \div \frac{5}{4} = \overset{2}{10} \times \frac{4}{\underset{1}{5}} = 8$$

Change the mixed number to an improper fraction. $1\frac{1}{4} = \frac{5}{4}$
Invert the divisor. Cancel and multiply.

So there were 8 girls in the Glee Club.

We know this is true because there are eight \$1.25's in \$10.

Tell how this
is done



$$6 \div 9\frac{3}{5} = 6 \div \frac{48}{5} = \overset{1}{6} \times \frac{5}{48} = \frac{5}{8}$$

Rule. To divide a whole number by a mixed number, change the mixed number to an improper fraction, invert the divisor, and multiply.

Divide. Cancel when possible. Check each exercise.

- | | | | |
|---------------------------|------------------------|------------------------|-------------------------|
| 1. $3 \div 1\frac{1}{2}$ | $10 \div 3\frac{1}{3}$ | $8 \div 1\frac{3}{5}$ | $11 \div 2\frac{3}{4}$ |
| 2. $4 \div 2\frac{1}{2}$ | $6 \div 3\frac{2}{3}$ | $9 \div 1\frac{7}{8}$ | $12 \div 1\frac{1}{6}$ |
| 3. $6 \div 2\frac{1}{4}$ | $8 \div 2\frac{2}{5}$ | $14 \div 4\frac{2}{7}$ | $20 \div 5\frac{1}{3}$ |
| 4. $9 \div 12\frac{1}{2}$ | $2 \div 3\frac{3}{4}$ | $7 \div 13\frac{1}{3}$ | $11 \div 12\frac{4}{5}$ |
| 5. $3 \div 4\frac{1}{2}$ | $5 \div 6\frac{2}{3}$ | $7 \div 8\frac{3}{4}$ | $14 \div 23\frac{1}{3}$ |
| 6. $13 \div 2\frac{1}{6}$ | $16 \div 2\frac{1}{4}$ | $15 \div 1\frac{1}{5}$ | $24 \div 26\frac{2}{3}$ |

7. If it takes $2\frac{1}{2}$ yd. of cloth to make a girl's dress, how many dresses can be made from a bolt of cloth 25 yd. long?

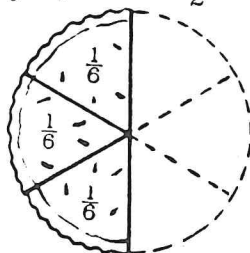
THE MEANING OF DIVIDING A FRACTION BY A WHOLE NUMBER

Mrs. Lyons divided $\frac{1}{2}$ a pie among 3 boys. What part of a pie did each boy get?

To find what part each got we divide $\frac{1}{2}$ by 3; that is $\frac{1}{2} \div 3$ and 3 is the divisor.

On the right, the heavy part shows $\frac{1}{2}$ a pie divided into 3 equal parts. We can see that each boy got $\frac{1}{6}$ of a pie. So $\frac{1}{2} \div 3 = \frac{1}{6}$. We know this is true because if anything is divided into 3 equal parts, each part is $\frac{1}{3}$; and $\frac{1}{3}$ of $\frac{1}{2} = \frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$.

We know, too, that $\frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$ gives the same answer as $\frac{1}{2} \div 3 = \frac{1}{6}$



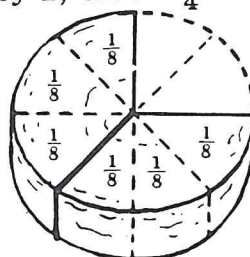
So, $\frac{1}{2} \div 3 = \frac{1}{2} \times \frac{1}{3} = \frac{1}{6}$

Mrs. Lyons divided $\frac{3}{4}$ of a cake between 2 ladies. What part of a cake did each lady get?

To find what part each got we divide $\frac{3}{4}$ by 2; that is $\frac{3}{4} \div 2$ and 2 is the divisor.

On the right, the heavy part shows $\frac{3}{4}$ of a cake divided into 2 equal parts. Each lady got $\frac{3}{8}$ of the cake. So $\frac{3}{4} \div 2 = \frac{3}{8}$. We know that is true because if anything is divided into 2 equal parts, each part is $\frac{1}{2}$; and $\frac{1}{2}$ of $\frac{3}{4} = \frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$.

We know, too, that $\frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$ gives the same answer as $\frac{3}{4} \div 2 = \frac{3}{8}$



So, $\frac{3}{4} \div 2 = \frac{3}{4} \times \frac{1}{2} = \frac{3}{8}$

If we look at the blocks on this page we can discover a rule for dividing a fraction by a whole number.

Rule. To divide a fraction by a whole number, invert the divisor and multiply.

Be sure you invert only the divisor. The divisor is always to the right of the division sign.

DIVIDING A FRACTION BY A WHOLE NUMBER

At the Scout camp breakfast the cook divided $\frac{7}{8}$ of a pound of cheese evenly among 14 boys. How much of a pound did each boy get?

To find what part of a pound each boy got we *divide* $\frac{7}{8}$ by 14.

$$\frac{7}{8} \div 14 = \frac{7}{8} \times \frac{1}{14} = \frac{1}{16}$$

Change the division exercise to a multiplication exercise. Invert the divisor 14 to make it $\frac{1}{14}$. Cancel and multiply.

So each boy got $\frac{1}{16}$ of a pound of cheese.

Invert and write as fractions.

1. 2, 4, 7, 3, 6, 10, 16, 12

Divide. Cancel when possible. Check each exercise.

2. $\frac{3}{4} \div 5$

$\frac{2}{5} \div 3$

$\frac{7}{8} \div 4$

$\frac{9}{10} \div 2$

3. $\frac{4}{5} \div 10$

$\frac{6}{7} \div 8$

$\frac{9}{16} \div 3$

$\frac{8}{9} \div 6$

4. $\frac{1}{4} \div 4$

$\frac{1}{6} \div 2$

$\frac{1}{8} \div 4$

$\frac{1}{2} \div 5$

5. $\frac{3}{8} \div 3$

$\frac{5}{12} \div 5$

$\frac{2}{9} \div 2$

$\frac{1}{3} \div 3$

6. $\frac{2}{3} \div 12$

$\frac{7}{10} \div 7$

$\frac{5}{8} \div 3$

$\frac{11}{16} \div 22$

7. $\frac{4}{7} \div 6$

$\frac{1}{9} \div 9$

$\frac{3}{5} \div 3$

$\frac{9}{20} \div 6$

PRACTICE IN DIVIDING A WHOLE NUMBER BY A FRACTION

8. $4 \div \frac{1}{3}$

$3 \div \frac{1}{5}$

$7 \div \frac{1}{2}$

$8 \div \frac{1}{4}$

9. $20 \div \frac{5}{6}$

$15 \div \frac{3}{4}$

$21 \div \frac{7}{8}$

$9 \div \frac{3}{16}$

10. $6 \div \frac{4}{5}$

$12 \div \frac{9}{16}$

$15 \div \frac{6}{7}$

$14 \div \frac{8}{9}$

11. $9 \div \frac{5}{8}$

$6 \div \frac{7}{10}$

$11 \div \frac{5}{6}$

$5 \div \frac{7}{12}$

DIVIDING A MIXED NUMBER BY A WHOLE NUMBER

Last summer Fred worked at his uncle's grocery. If Fred was paid $\$18\frac{3}{4}$ for 15 days work, how much did he earn each day.

To find how much Fred earned each day we *divide* $18\frac{3}{4}$ by 15. Change the mixed number to an improper fraction.

$$18\frac{3}{4} \div 15 = \frac{75}{4} \div 15 = \frac{75}{4} \times \frac{1}{15} = \frac{5}{4} = 1\frac{1}{4}$$

$$18\frac{3}{4} = \frac{75}{4}$$

Invert the divisor. Cancel and multiply.

So Fred earned $\$1\frac{1}{4}$ a day; which is $\$1.25$. We know this is true because $15 \times \$1.25 = \$18.75$ which is $\$18\frac{3}{4}$.

Tell how this is done



$$5\frac{1}{3} \div 8 = \frac{16}{3} \div 8 = \frac{16}{3} \times \frac{1}{8} = \frac{2}{3}$$

Rule. To divide a mixed number by a whole number change the mixed number to an improper fraction, invert the divisor, and multiply.

Divide. Cancel when possible. Check each exercise.

- | | | | |
|---------------------------|-------------------------|------------------------|-------------------------|
| 1. $3\frac{1}{4} \div 2$ | $7\frac{2}{5} \div 3$ | $9\frac{1}{2} \div 4$ | $8\frac{3}{8} \div 5$ |
| 2. $4\frac{1}{2} \div 3$ | $6\frac{2}{3} \div 5$ | $8\frac{3}{4} \div 7$ | $13\frac{3}{5} \div 6$ |
| 3. $1\frac{2}{3} \div 2$ | $3\frac{2}{5} \div 4$ | $4\frac{1}{2} \div 5$ | $2\frac{1}{5} \div 3$ |
| 4. $1\frac{1}{5} \div 4$ | $7\frac{1}{2} \div 9$ | $4\frac{9}{10} \div 7$ | $2\frac{1}{12} \div 5$ |
| 5. $11\frac{1}{2} \div 6$ | $15\frac{1}{3} \div 4$ | $4\frac{3}{4} \div 8$ | $8\frac{7}{18} \div 9$ |
| 6. $5\frac{3}{7} \div 5$ | $21\frac{2}{3} \div 10$ | $8\frac{4}{5} \div 16$ | $16\frac{4}{9} \div 12$ |

7. Allan was making shelves in his mother's pantry. In the woodshed he found a board $19\frac{1}{2}$ ft. long. To make the shelves Allan cut the board into 6 equal pieces. How long was the board for each shelf?



PROBLEMS USING DIVISION OF FRACTIONS

1. Mr. Jonson dug 27 bu. of potatoes to sell at the market. He put the potatoes in bags with $1\frac{1}{2}$ bu. in each bag. How many bags did he need?

2. Mrs. White bought 10 lb. of butter. If her family used $\frac{5}{8}$ lb. each day, how many days would the 10 lb. last?

3. Mr. Milligan divided $\frac{2}{3}$ qt. of ice-cream evenly among 6 boys. What part of a quart did each boy get?

4. Mary bought $3\frac{3}{4}$ lb. of candy for her birthday party. If there were 15 girls at the party and each got the same amount of candy, how much did each girl get?

5. Mrs. Tarr bought 9 yd. of material for curtains for her living-room. If each curtain was $2\frac{1}{4}$ yd. long, how many curtains did she make?

6. On a hunting trip Jack's father walked $12\frac{1}{2}$ miles in 5 hr. How many miles an hour did he average?

7. When the church fair was over there was $\frac{3}{4}$ of a cake left. If it was divided evenly among 9 boys, what part of the whole cake did each boy get?

8. A contractor has 12 mi. of road to pave. If his men can pave $\frac{3}{4}$ mi. a day, how many days will it take to pave the road?



DAVISON'S BAKERY

Mr. Davison runs a small bakery. He sells his bread, rolls, doughnuts, cookies, and cakes in his own front store. It is a small business but he enjoys the work and he is his own boss.

1. He has to buy a lot of flour for his bakery. Last week he bought 48 bags of flour at \$5.60 a bag. How much did it cost him?

2. He can bake 64 loaves of bread at a time in his oven. If each loaf weighs $1\frac{1}{4}$ lb. when baked, how much will all the loaves he can bake at one time weigh?

3. On Monday last, he sold 192 loaves of bread at 14¢ a loaf. How much did he get for the bread?

4. When he bakes rolls he bakes 5 doz. rolls to a tray. How many rolls will he have if he bakes 8 trays?

5. How much will he get for the rolls in Question 4 if he sells them at 12¢ a dozen?

6. Last week, he sold 165 doz. rolls; 97 doz. doughnuts; and 326 doz. cookies. How many dozen did he sell altogether?

7. Bill Jones and Tom Smith each had a birthday last month. Mr. Davison made a birthday cake for each boy. If Bill's cake cost \$3.30 and Tom's \$2.75, how much more did Bill's cake cost?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	4054	8138	6546	8837	2095
	5133	4916	4864	3486	7423
	7455	7083	5331	4124	4964
	8580	1547	4168	8805	8652
	9239	8802	3639	1292	1545
	<u>8377</u>	<u>2586</u>	<u>9879</u>	<u>7726</u>	<u>5638</u>

Subtract. Check each exercise.

2.	13617	16550	84542	50779	64943
	<u>8354</u>	<u>9262</u>	<u>53627</u>	<u>47294</u>	<u>30255</u>
3.	25619	98238	62443	34631	23734
	<u>21873</u>	<u>23469</u>	<u>56780</u>	<u>16958</u>	<u>19847</u>
4.	65623	78060	40206	50800	70003
	<u>49794</u>	<u>58504</u>	<u>10307</u>	<u>20013</u>	<u>65789</u>

Multiply. Check each answer.

5.	4697	2874	1690	5837	3086
	<u>6</u>	<u>5</u>	<u>7</u>	<u>9</u>	<u>8</u>
6.	87	83	95	469	702
	<u>70</u>	<u>46</u>	<u>48</u>	<u>29</u>	<u>83</u>
7.	468	674	598	817	976
	<u>138</u>	<u>427</u>	<u>200</u>	<u>390</u>	<u>605</u>

Divide. Check each answer.

8.	83) <u>45069</u>	29) <u>21876</u>	14) <u>10593</u>	44) <u>42367</u>
9.	92) <u>69920</u>	58) <u>37721</u>	75) <u>30675</u>	37) <u>29834</u>
10.	145) <u>11310</u>	693) <u>100485</u>	829) <u>171603</u>	

KEEPING THE TOOLS SHARP

Add. Each answer must be in lowest terms.

$$1. \quad \begin{array}{r} 6\frac{1}{5} \\ 2\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{1}{2} \\ 6\frac{3}{10} \\ \hline \end{array} \quad \begin{array}{r} 1\frac{7}{12} \\ 4\frac{11}{12} \\ \hline \end{array} \quad \begin{array}{r} 12\frac{3}{4} \\ 5\frac{11}{16} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{1}{3} \\ 2\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{5}{8} \\ 7\frac{7}{8} \\ \hline \end{array}$$

$$2. \quad \begin{array}{r} 5\frac{1}{3} \\ 9\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 10\frac{1}{6} \\ 5\frac{5}{12} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{1}{4} \\ 12\frac{9}{10} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{2}{9} \\ 6\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 16\frac{3}{4} \\ 4\frac{4}{5} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{3}{4} \\ 3\frac{1}{6} \\ \hline \end{array}$$

$$3. \quad \begin{array}{r} 15\frac{3}{8} \\ 7\frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{11}{20} \\ 4\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{2}{5} \\ 18\frac{1}{6} \\ \hline \end{array} \quad \begin{array}{r} 21\frac{3}{10} \\ 5\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 1\frac{2}{3} \\ 14\frac{2}{5} \\ \hline \end{array} \quad \begin{array}{r} 13\frac{5}{12} \\ 4\frac{7}{10} \\ \hline \end{array}$$

Subtract. Each answer must be in lowest terms.

$$4. \quad \begin{array}{r} 7\frac{7}{8} \\ 1\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 4\frac{5}{12} \\ 2\frac{7}{12} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{5}{8} \\ 4\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{7}{20} \\ 6\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{4}{5} \\ 1\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{1}{4} \\ 5\frac{5}{6} \\ \hline \end{array}$$

$$5. \quad \begin{array}{r} 9\frac{1}{4} \\ 3\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 10\frac{3}{16} \\ 3\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{1}{6} \\ 6\frac{3}{10} \\ \hline \end{array} \quad \begin{array}{r} 5\frac{1}{3} \\ 4\frac{11}{12} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{1}{3} \\ 2\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 10\frac{7}{8} \\ 7\frac{1}{6} \\ \hline \end{array}$$

$$6. \quad \begin{array}{r} 9\frac{1}{12} \\ 2\frac{1}{6} \\ \hline \end{array} \quad \begin{array}{r} 12\frac{1}{4} \\ 5\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} 14\frac{5}{12} \\ 12\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{1}{2} \\ 6\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{3}{10} \\ 4\frac{7}{12} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{5}{6} \\ 4\frac{3}{5} \\ \hline \end{array}$$

Multiply. Each answer must be in lowest terms.

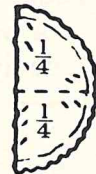
$$7. \quad 8 \times \frac{3}{4} \qquad \frac{7}{8} \times 12 \qquad 9 \times \frac{2}{3} \qquad 2\frac{1}{5} \times \frac{1}{2}$$

$$8. \quad \frac{1}{4} \times \frac{2}{5} \qquad \frac{3}{10} \times \frac{7}{12} \qquad \frac{5}{6} \times 3\frac{3}{5} \qquad \frac{3}{8} \times 4\frac{1}{2}$$

$$9. \quad 3\frac{1}{3} \times \frac{5}{6} \qquad 1\frac{1}{2} \times \frac{3}{8} \qquad 2\frac{3}{4} \times 1\frac{1}{3} \qquad 4\frac{4}{5} \times 4\frac{1}{6}$$

THE MEANING OF DIVIDING A FRACTION BY A FRACTION

How many $\frac{1}{4}$'s of a pie was there in $\frac{1}{2}$ the pie?
To find out we *divide* $\frac{1}{2}$ by $\frac{1}{4}$. This is
written, $\frac{1}{2} \div \frac{1}{4}$ which means, "how many $\frac{1}{4}$'s
in $\frac{1}{2}$?" and $\frac{1}{4}$ is the *divisor*. From the drawing
we see that there are **two** $\frac{1}{4}$'s in $\frac{1}{2}$.



$$\text{So, } \frac{1}{2} \div \frac{1}{4} = 2$$

But $\frac{1}{2} \times 4 = 2$, gives the same answer as $\frac{1}{2} \div \frac{1}{4} = 2$

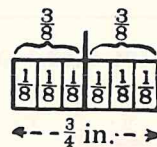
$$\text{So, } \frac{1}{2} \div \frac{1}{4} = \frac{1}{2} \times \frac{4}{1} = 2$$

The block on the right is $\frac{3}{4}$ in. long.

How many $\frac{3}{8}$ in. are there in $\frac{3}{4}$ in.?

To find out we *divide* $\frac{3}{4}$ by $\frac{3}{8}$ which we write,
 $\frac{3}{4} \div \frac{3}{8}$.

This means, "how many $\frac{3}{8}$'s in $\frac{3}{4}$?" and $\frac{3}{8}$ is
the *divisor*.



We see that there are two $\frac{3}{8}$'s in $\frac{3}{4}$. So, $\frac{3}{4} \div \frac{3}{8} = 2$

But $\frac{3}{4} \times \frac{8}{3} = 2$, gives the same answer as $\frac{3}{4} \div \frac{3}{8} = 2$

$$\text{So, } \frac{3}{4} \div \frac{3}{8} = \frac{3}{4} \times \frac{8}{3} = 2$$

$\frac{1}{4} \div \frac{1}{2}$ means, "how many $\frac{1}{2}$'s in $\frac{1}{4}$?"

Notice that the divisor, $\frac{1}{2}$ is larger than the
dividend, $\frac{1}{4}$.



We see that there is $\frac{1}{2}$ of $\frac{1}{2}$ in $\frac{1}{4}$. So, $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$

But $\frac{1}{4} \times \frac{2}{1} = \frac{1}{2}$ gives the same answer as $\frac{1}{4} \div \frac{1}{2} = \frac{1}{2}$

$$\text{So, } \frac{1}{4} \div \frac{1}{2} = \frac{1}{4} \times \frac{2}{1} = \frac{1}{2}$$

*Rule: To divide a fraction by a fraction, invert the
divisor and multiply.*

DIVIDING A FRACTION BY A FRACTION

Mr. Toole sells vegetable seeds. If he puts $\frac{1}{16}$ lb. of turnip seed to a package, how many packages will he have from $\frac{7}{8}$ lb. of turnip seed?

$$\frac{7}{8} \div \frac{1}{16} = \frac{7}{\cancel{8}^2} \times \cancel{16}_1 = 14$$

To find out we *divide* $\frac{7}{8}$ by $\frac{1}{16}$ which means, "how many $\frac{1}{16}$'s in $\frac{7}{8}$?"
Invert the divisor. Cancel and multiply.

So Mr. Toole will have 14 packages.

Tell how
these are
done



$$\frac{5}{6} \div \frac{2}{5} = \frac{5}{6} \times \frac{5}{2} = \frac{25}{12} = 2\frac{1}{12}$$



$$\frac{2}{3} \div \frac{3}{4} = \frac{2}{3} \times \frac{4}{3} = \frac{8}{9}$$

Invert each of these fractions.

1. $\frac{2}{3}, \frac{4}{5}, \frac{1}{6}, \frac{3}{8}, \frac{7}{10}, \frac{1}{4}, \frac{2}{9}, \frac{5}{16}, \frac{1}{12}$

Divide.

Cancel when possible. Check each exercise.

- | | | | | |
|------------------------------------|-----------------------------------|----------------------------------|----------------------------------|----------------------------------|
| 2. $\frac{1}{2} \div \frac{1}{8}$ | $\frac{1}{3} \div \frac{1}{6}$ | $\frac{3}{5} \div \frac{1}{10}$ | $\frac{5}{7} \div \frac{5}{12}$ | $\frac{2}{3} \div \frac{1}{12}$ |
| 3. $\frac{4}{5} \div \frac{2}{2}$ | $\frac{3}{4} \div \frac{1}{5}$ | $\frac{7}{8} \div \frac{2}{3}$ | $\frac{11}{12} \div \frac{2}{5}$ | $\frac{1}{4} \div \frac{1}{5}$ |
| 4. $\frac{3}{4} \div \frac{1}{2}$ | $\frac{5}{8} \div \frac{1}{4}$ | $\frac{9}{10} \div \frac{3}{5}$ | $\frac{15}{16} \div 2$ | $\frac{5}{6} \div \frac{3}{4}$ |
| 5. $\frac{3}{8} \div \frac{3}{8}$ | $\frac{3}{4} \div \frac{3}{16}$ | $\frac{5}{6} \div \frac{4}{5}$ | $\frac{3}{4} \div \frac{2}{3}$ | $\frac{13}{16} \div \frac{3}{8}$ |
| 6. $\frac{1}{3} \div \frac{1}{2}$ | $\frac{2}{5} \div \frac{3}{7}$ | $\frac{5}{16} \div \frac{1}{3}$ | $\frac{2}{3} \div \frac{3}{4}$ | $\frac{3}{10} \div \frac{2}{3}$ |
| 7. $\frac{1}{2} \div \frac{3}{4}$ | $\frac{1}{3} \div \frac{5}{6}$ | $\frac{7}{12} \div \frac{2}{3}$ | $\frac{4}{15} \div \frac{3}{5}$ | $\frac{9}{16} \div \frac{7}{8}$ |
| 8. $\frac{7}{8} \div \frac{3}{4}$ | $\frac{11}{16} \div \frac{3}{10}$ | $\frac{5}{9} \div \frac{5}{6}$ | $\frac{1}{2} \div \frac{7}{12}$ | $\frac{1}{10} \div \frac{2}{5}$ |
| 9. $\frac{4}{5} \div \frac{2}{15}$ | $\frac{1}{6} \div \frac{8}{9}$ | $\frac{1}{2} \div \frac{11}{12}$ | $\frac{9}{10} \div \frac{3}{8}$ | $\frac{3}{4} \div \frac{15}{16}$ |

10. George picked $\frac{3}{4}$ gal. of blueberries. How many blueberry baskets each holding $\frac{1}{8}$ gal. can George fill with the blueberries he picked?

11. At the school track meet the officials wear ribbon badges. How many badges, each $\frac{1}{12}$ yd. long, can be made from a piece of ribbon $\frac{5}{8}$ yd. long?

DIVIDING A MIXED NUMBER BY A FRACTION

Mrs. Totten is just setting up housekeeping. How many face towels each $\frac{3}{4}$ yd. long can she make from a piece of towelling $13\frac{1}{2}$ yd. long?

To find out how many face towels she can make we *divide* $13\frac{1}{2}$ by $\frac{3}{4}$.

Change the mixed number to an improper fraction.

$$13\frac{1}{2} = \frac{27}{2}$$

Invert the divisor. Cancel and multiply.

$$13\frac{1}{2} \div \frac{3}{4} = \frac{27}{2} \div \frac{3}{4} = \frac{27}{2} \times \frac{4}{3} = 18$$

So, she can make 18 face towels.

Tell how
these are
done



$$2\frac{1}{4} \div \frac{1}{3} = \frac{9}{4} \div \frac{1}{3} = \frac{9}{4} \times \frac{3}{1} = \frac{27}{4} = 6\frac{3}{4}$$



$$1\frac{3}{8} \div \frac{3}{10} = \frac{11}{8} \div \frac{3}{10} = \frac{11}{8} \times \frac{10}{3} = \frac{55}{12} = 4\frac{7}{12}$$

Rule: To divide a mixed number by a fraction, change the mixed number to an improper fraction, invert the divisor and multiply.

Divide.

Cancel when possible.

Check each exercise.

1. $5\frac{1}{2} \div \frac{1}{4}$

$2\frac{2}{3} \div \frac{1}{6}$

$4\frac{1}{5} \div \frac{7}{10}$

$3\frac{3}{8} \div \frac{9}{16}$

2. $1\frac{1}{2} \div \frac{2}{3}$

$2\frac{4}{5} \div \frac{3}{4}$

$4\frac{5}{8} \div \frac{2}{3}$

$5\frac{3}{5} \div \frac{5}{8}$

3. $2\frac{5}{6} \div \frac{2}{3}$

$3\frac{3}{4} \div \frac{3}{10}$

$6\frac{3}{10} \div \frac{7}{12}$

$4\frac{1}{6} \div \frac{5}{8}$

4. $4\frac{1}{2} \div \frac{1}{5}$

$1\frac{3}{5} \div \frac{1}{4}$

$3\frac{1}{4} \div \frac{1}{3}$

$2\frac{1}{3} \div \frac{1}{8}$

5. $1\frac{4}{5} \div \frac{1}{3}$

$2\frac{2}{3} \div \frac{3}{4}$

$2\frac{3}{4} \div \frac{1}{8}$

$8\frac{1}{6} \div \frac{7}{16}$

6. The teacher bought $7\frac{1}{2}$ lb. of nuts for the children's Christmas tree. She made small bags and put $\frac{1}{4}$ lb. of nuts in each bag. How many children got a bag of nuts?

7. At the Grade VI picnic each child was given $\frac{1}{4}$ qt. of ice-cream. How many were served if $7\frac{3}{4}$ qt. of ice-cream were used?

DIVIDING A FRACTION BY A MIXED NUMBER

There is a large patch of raspberries in Roy's father's garden. One day Roy picked $\frac{5}{8}$ gal. of raspberries in $1\frac{1}{2}$ hr. At the same rate how much did he pick in 1 hr?

To find out how much he picked we *divide* $\frac{5}{8}$ by $1\frac{1}{2}$.

$$\frac{5}{8} \div 1\frac{1}{2} = \frac{5}{8} \div \frac{3}{2} = \frac{5}{8} \times \frac{2}{3} = \frac{5}{12}$$

Change the mixed number to an improper fraction. $1\frac{1}{2} = \frac{3}{2}$. Invert the divisor. Cancel and multiply.

So Roy picked $\frac{5}{12}$ gal. in 1 hr.

Tell how
these are
done



$$\frac{3}{5} \div 2\frac{1}{2} = \frac{3}{5} \div \frac{5}{2} = \frac{3}{5} \times \frac{2}{5} = \frac{6}{25}$$



$$\frac{1}{4} \div 1\frac{1}{8} = \frac{1}{4} \div \frac{9}{8} = \frac{1}{4} \times \frac{8}{9} = \frac{2}{9}$$

Rule. To divide a fraction by a mixed number, change the mixed number to an improper fraction, invert the divisor and multiply.

Divide. Cancel when possible. Check each exercise.

- | | | | |
|-------------------------------------|------------------------------------|-----------------------------------|-----------------------------------|
| 1. $\frac{3}{4} \div 1\frac{2}{3}$ | $\frac{2}{5} \div 2\frac{1}{2}$ | $\frac{2}{3} \div 1\frac{1}{4}$ | $\frac{5}{6} \div 1\frac{3}{5}$ |
| 2. $\frac{3}{8} \div 1\frac{1}{4}$ | $\frac{4}{7} \div 2\frac{2}{5}$ | $\frac{5}{12} \div 1\frac{7}{8}$ | $\frac{9}{10} \div 5\frac{2}{5}$ |
| 3. $\frac{8}{9} \div 3\frac{1}{3}$ | $\frac{11}{12} \div 16\frac{1}{2}$ | $\frac{4}{5} \div 2\frac{2}{3}$ | $1\frac{3}{16} \div 9\frac{3}{4}$ |
| 4. $\frac{1}{3} \div 2\frac{1}{2}$ | $\frac{1}{5} \div 1\frac{1}{4}$ | $\frac{1}{8} \div 3\frac{1}{2}$ | $\frac{1}{2} \div 1\frac{3}{7}$ |
| 5. $\frac{1}{6} \div 2\frac{1}{12}$ | $\frac{1}{10} \div 1\frac{1}{15}$ | $\frac{1}{4} \div 3\frac{1}{8}$ | $\frac{1}{10} \div 1\frac{1}{4}$ |
| 6. $\frac{3}{10} \div 2\frac{2}{5}$ | $\frac{5}{16} \div 3\frac{3}{4}$ | $\frac{14}{15} \div 1\frac{3}{5}$ | $\frac{1}{6} \div 3\frac{1}{3}$ |
| 7. $\frac{2}{3} \div 1\frac{5}{6}$ | $\frac{3}{5} \div 1\frac{1}{2}$ | $\frac{5}{12} \div 3\frac{3}{4}$ | $\frac{7}{10} \div 3\frac{1}{3}$ |
| 8. $\frac{1}{2} \div 5\frac{1}{4}$ | $\frac{5}{6} \div 2\frac{1}{2}$ | $\frac{7}{16} \div 1\frac{3}{4}$ | $\frac{11}{12} \div 2\frac{1}{5}$ |

9. Donald and his friends were on a camping trip. They ate $\frac{3}{4}$ of their food supply in $1\frac{1}{2}$ days. At that rate what part of their food supply did they eat in 1 day?

DIVIDING A MIXED NUMBER BY A MIXED NUMBER

Tony was helping his father to make new front steps for their house. If each step is to be $3\frac{1}{4}$ ft. long, how many steps can be made from a board $19\frac{1}{2}$ ft. long?

To find how many steps can be made we *divide* $19\frac{1}{2}$ by $3\frac{1}{4}$.

Change the mixed number to improper fractions.

Invert the divisor. Cancel and multiply.

So, 6 steps can be made.

$$19\frac{1}{2} \div 3\frac{1}{4} = \frac{39}{2} \div \frac{13}{4} = \frac{39}{2} \times \frac{4}{13} = 6$$

Tell how
these are
done



$$3\frac{2}{5} \div 1\frac{1}{3} = \frac{17}{5} \div \frac{4}{3} = \frac{17}{5} \times \frac{3}{4} = \frac{51}{20} = 2\frac{11}{20}$$



$$1\frac{5}{8} \div 2\frac{1}{2} = \frac{11}{8} \div \frac{5}{2} = \frac{11}{8} \times \frac{2}{5} = \frac{11}{20}$$

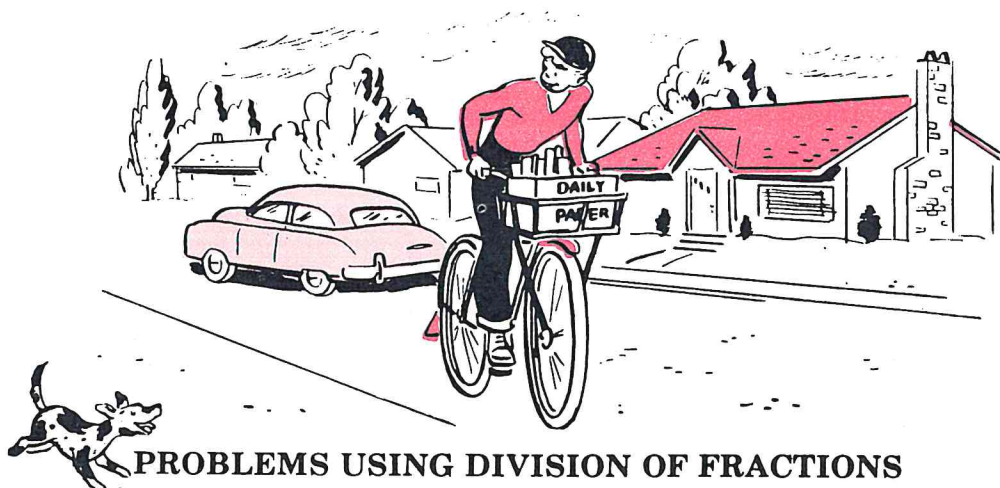
Rule. To divide a mixed number by a mixed number, change the mixed numbers to improper fractions, invert the divisor and multiply.

Divide. Cancel when necessary. Check each exercise.

- | | | | |
|-------------------------------------|----------------------------------|-----------------------------------|------------------------------------|
| 1. $4\frac{1}{2} \div 2\frac{1}{4}$ | $6\frac{2}{3} \div 1\frac{2}{3}$ | $9\frac{1}{3} \div 1\frac{1}{6}$ | $13\frac{3}{4} \div 2\frac{3}{4}$ |
| 2. $3\frac{1}{2} \div 1\frac{1}{3}$ | $5\frac{3}{4} \div 1\frac{1}{5}$ | $6\frac{3}{4} \div 3\frac{1}{3}$ | $4\frac{1}{2} \div 1\frac{2}{5}$ |
| 3. $7\frac{1}{3} \div 2\frac{1}{5}$ | $8\frac{1}{2} \div 1\frac{1}{6}$ | $5\frac{1}{4} \div 1\frac{1}{8}$ | $5\frac{5}{8} \div 1\frac{11}{16}$ |
| 4. $1\frac{1}{2} \div 3\frac{1}{3}$ | $2\frac{2}{5} \div 3\frac{1}{2}$ | $3\frac{3}{4} \div 5\frac{5}{8}$ | $2\frac{1}{3} \div 3\frac{1}{3}$ |
| 5. $1\frac{1}{3} \div 3\frac{1}{3}$ | $2\frac{1}{2} \div 3\frac{3}{4}$ | $2\frac{5}{6} \div 7\frac{1}{12}$ | $2\frac{1}{5} \div 7\frac{7}{10}$ |
| 6. $9\frac{3}{4} \div 2\frac{1}{6}$ | $3\frac{2}{3} \div 1\frac{3}{5}$ | $4\frac{3}{4} \div 7\frac{1}{8}$ | $13\frac{4}{5} \div 2\frac{3}{10}$ |

7. If it takes an Indian $2\frac{1}{3}$ hr. to make a basket, how many baskets can be made by working $18\frac{2}{3}$ hr.?

8. The total weight of a shipment of chickens is $89\frac{1}{4}$ lb. If the average weight of the chickens is $5\frac{1}{4}$ lb., how many chickens are there in the shipment?



PROBLEMS USING DIVISION OF FRACTIONS

1. Jack has a newspaper route. When he walks, it takes him $2\frac{1}{4}$ hr. to deliver his papers. When he uses his bicycle it takes him $\frac{3}{4}$ hr. How many times faster can he deliver his papers if he uses his bicycle?

2. Billy has his own pony. He gives the pony $\frac{1}{32}$ bu. of oats a day. How long will $\frac{7}{8}$ bu. of oats last Billy's pony?

3. It was house-cleaning time and Mrs. Clayton made new curtains for her windows. If each curtain took $2\frac{2}{3}$ yd. of material, how many curtains did she make from $21\frac{1}{3}$ yd. of material?

4. Last Saturday it took Tom $1\frac{1}{2}$ hr. to mow $\frac{1}{2}$ the lawn. At that rate what part of the lawn did he mow in 1 hr.?

5. Helen and her friends made $6\frac{3}{4}$ lb. of fudge for the school concert. If they put it in bags with $\frac{3}{8}$ lb. in each bag, how many bags of fudge did they have?

6. How many pieces of cloth, $\frac{1}{6}$ yd. wide, must be sewn together to make a banner $\frac{2}{3}$ yd. wide?

7. Ella had $7\frac{1}{2}$ ft. of red ribbon. How many hair-ribbons, each $1\frac{1}{2}$ ft. long, can Ella make from the ribbon?

8. A small manufacturing plant uses $\frac{3}{4}$ T. of coal a day. In how many days will it use $7\frac{1}{2}$ T.?

ESTIMATING THE ANSWER

In multiplying and dividing with fractions we may sometimes get an answer that is *unreasonable*. To avoid this we should *estimate the answer* before we do the work. Then compare the answer we get with the estimated answer. This will help us to get *reasonable answers*. Study the examples below.

Find: $2\frac{3}{4} \times 7\frac{1}{5}$ Think, "$2\frac{3}{4}$ is about 3 and $7\frac{1}{5}$ is about 7. So $2\frac{3}{4} \times 7\frac{1}{5}$ is about $3 \times 7 = 21$". <i>The Work</i> $2\frac{3}{4} \times 7\frac{1}{5} = \frac{11}{4} \times \frac{36}{5} = \frac{99}{5} = 19\frac{4}{5}$ The answer, $19\frac{4}{5}$, is about the same as the estimated answer, 21. So $19\frac{4}{5}$ is a reasonable answer. To make sure it is correct, check the work.	Find: $7\frac{4}{5} \div 2\frac{1}{6}$ Think "$7\frac{4}{5}$ is about 8 and $2\frac{1}{6}$ is about 2. So $7\frac{4}{5} \div 2\frac{1}{6}$ is about $8 \div 2 = 4$". <i>The Work</i> $7\frac{4}{5} \div 2\frac{1}{6} = \frac{39}{5} \div \frac{13}{6} = \frac{39}{5} \times \frac{6}{13} = \frac{18}{5} = 3\frac{3}{5}$ The answer $3\frac{3}{5}$ is about the same as the estimated answer, 4. So $3\frac{3}{5}$ is a reasonable answer. To make sure it is correct, check the work.
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Estimate the answer before you do the work. Be sure the answer is reasonable.

- | | | | |
|---------------------------------------|--------------------------------------|---------------------------------------|--------------------------------------|
| 1. $3\frac{1}{3} \times 4\frac{7}{8}$ | 4. $\frac{4}{5} \times 2\frac{1}{6}$ | 5. $\frac{1}{10} \times 6\frac{2}{3}$ | 8. $\frac{1}{4} \times 5\frac{3}{5}$ |
| 2. $7\frac{7}{10} \div 2\frac{1}{5}$ | 3. $8\frac{2}{3} \div 3\frac{1}{4}$ | 6. $15\frac{3}{4} \div 4\frac{1}{5}$ | 7. $22\frac{4}{5} \div 3\frac{1}{8}$ |

In division with fractions there is another trick that will help you get a reasonable answer.

You know that $3 \div 3 = 1$ because the dividend and divisor are the same. $7 \div 3 =$ more than 1 because the divisor, 3, is smaller than the dividend, 7. Similarly, $3 \div 7 = \frac{3}{7}$ is less than 1 because the divisor, 7, is larger than the dividend, 3. Use this trick to tell whether the answers to the exercises below are more than 1 or less than 1.

- | | | | |
|-------------------------------------|--------------------------------------|------------------------------------|-----------------------------------|
| 3. $6\frac{1}{2} \div 1\frac{2}{3}$ | 4. $24\frac{1}{4} \div 7\frac{1}{2}$ | 5. $\frac{2}{5} \div \frac{9}{10}$ | 6. $\frac{3}{4} \div \frac{1}{6}$ |
|-------------------------------------|--------------------------------------|------------------------------------|-----------------------------------|



USING FRACTIONS AT THE CHURCH PICNIC

The day for the Church picnic arrived bright and clear. Everyone was happy and all had a good time.

1. Mrs. Evans cooked 3 chickens at home for the picnic. If the chickens weighed, $5\frac{1}{2}$ lb.; $6\frac{3}{8}$ lb., and $5\frac{3}{4}$ lb., how much did they weigh altogether?

2. At the picnic supper the ladies served 8 lemon pies. If each person served got $\frac{1}{6}$ of a pie, how many persons were served with lemon pie?

3. Mr. Allan said that they used $1\frac{2}{3}$ bu. of potatoes at each meal served at the picnic. If 3 meals were served how many bushels of potatoes were used?

4. One of the games at the picnic was "guessing weights". The man guessed that Roy weighed 83 lb., but Roy's real weight was $79\frac{1}{4}$ lb. How many pounds less did Roy weigh than the man guessed he weighed?

5. At the refreshment booth there was a jug which held $1\frac{7}{8}$ qt. of lemonade. If this lemonade was divided evenly among 5 persons, how much would each get?

6. Mr. Calder supplied $7\frac{1}{2}$ gal. of milk for the picnic. If $\frac{3}{4}$ of the milk was used, how many gallons were used?

7. Joan stayed at the picnic $4\frac{2}{5}$ hr., and Lillian stayed $2\frac{1}{2}$ hr. How much longer did Joan stay than Lillian?

8. Each of the ladies who served meals at the picnic wore a badge $\frac{1}{4}$ yd. long. If it took $3\frac{1}{2}$ yd. of ribbon to make the badges, how many women served meals?

DIAGNOSTIC TEST IN DIVISION OF FRACTIONS

The work below will test you in the kinds of examples you should know in division of fractions. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

DIVIDING A WHOLE NUMBER BY A FRACTION				Page
1. $8 \div \frac{1}{3}$	$6 \div \frac{5}{8}$	$2 \div \frac{4}{7}$	$10 \div \frac{5}{12}$	124
DIVIDING A WHOLE NUMBER BY A MIXED NUMBER				
2. $10 \div 2\frac{1}{2}$	$8 \div 2\frac{2}{5}$	$3 \div 6\frac{1}{4}$	$5 \div 8\frac{1}{3}$	125
DIVIDING A FRACTION BY A WHOLE NUMBER				
3. $\frac{5}{6} \div 4$	$\frac{9}{10} \div 6$	$\frac{1}{3} \div 5$	$\frac{7}{16} \div 7$	127
DIVIDING A MIXED NUMBER BY A WHOLE NUMBER				
4. $4\frac{2}{3} \div 3$	$7\frac{1}{5} \div 6$	$2\frac{1}{8} \div 5$	$2\frac{1}{12} \div 15$	128
DIVIDING A FRACTION BY A FRACTION				
5. $\frac{3}{4} \div \frac{1}{8}$	$\frac{7}{9} \div \frac{1}{2}$	$\frac{3}{10} \div \frac{2}{3}$	$\frac{7}{12} \div \frac{5}{6}$	134
DIVIDING A MIXED NUMBER BY A FRACTION				
6. $4\frac{1}{5} \div \frac{7}{10}$	$2\frac{5}{8} \div \frac{2}{3}$	$3\frac{1}{4} \div \frac{5}{6}$	$5\frac{1}{2} \div \frac{1}{3}$	135
DIVIDING A FRACTION BY A MIXED NUMBER				
7. $\frac{3}{4} \div 1\frac{3}{7}$	$\frac{9}{20} \div 4\frac{1}{2}$	$\frac{1}{3} \div 2\frac{4}{5}$	$\frac{1}{4} \div 1\frac{1}{2}$	136
DIVIDING A MIXED NUMBER BY A MIXED NUMBER				
8. $7\frac{1}{4} \div 2\frac{5}{12}$	$8\frac{1}{3} \div 2\frac{1}{7}$	$14 \div 2\frac{1}{2}$	$31 \div 5\frac{5}{6}$	137

HOW MUCH FOR SEVERAL?

A railroad train travelled a distance of 315 mi. in 7 hr. At the same rate how many miles will this train travel in 16 hr.? To find out, we find the distance the train will travel in 1 hr., and then find the distance it will travel in 16 hr.

In 7 hr. train travels 315 mi.

In 1 hr. train travels $\frac{315}{7} = 45$ mi.

In 16 hr. train travels 16×45 mi. = 720 mi.

So the train will travel 720 mi. in 16 hr.

45	45
7 $\overline{)315}$	$\times 16$
28	<u>270</u>
35	45
<u>35</u>	<u>720</u>

1. If Mrs. Leonard paid \$3.69 for 3 pairs of stockings, how much would she have paid if she bought 5 pairs?

2. Mr. Bowden took ill at his work yesterday. He worked only 5 hr. and was paid \$4.50. How much would he have earned if he worked 8 hr.?

3. Tom's father paid \$2.52 for 6 gal. of gasoline. At the same rate how much would he have paid if he bought 10 gal.?

4. An automobile factory produced 500 cars in 4 days. At the same rate, how many automobiles would be produced in 9 days?

5. If 2 cans of tomato soup cost 23¢, how much will 6 cans cost?

(Hint: 6 cans will cost 3 times as much as 2 cans.)

6. If oranges are selling 2 doz. for 45¢, how much will 8 doz. cost?

(Hint: 8 doz. will cost 4 times as much as 2 doz.)

7. If corn-flakes are 2 boxes for 29¢, how much will 4 boxes cost?

8. Apple juice is advertised, 3 cans for 28¢. How much will 9 cans cost?

9. Peas are selling, 2 cans for 25¢. How much will a dozen cans cost?

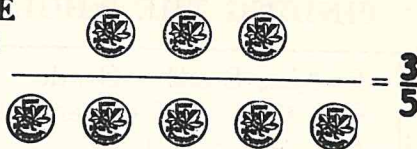
10. If handkerchiefs are selling 4 for \$1, how much will a dozen cost?

FINDING WHAT PART ONE NUMBER IS OF ANOTHER

Dick had 3¢; Roy had 5¢.

Dick had $\frac{3}{5}$ as much as Roy.

The illustration shows that 3 is $\frac{3}{5}$ of 5.



Note that to find what part 3 is of 5, we write the numbers as a fraction, with the number of which the other is a part as the denominator.

1. What part is 2 of 7? 8 of 15? 12 of 25?

Whenever we want to find what part one number is of another number we must make sure that the numbers have the same name. Study the example below.

A package of soda weighs 6 oz. What part of a pound is this?

In order that the numbers have the same name change 1 lb. to 16 oz.

Now find what part 6 is of 16.

Write the numbers as a fraction with 16 as the denominator.

Change the fraction to lowest terms.

So 6 ounces is $\frac{3}{8}$ of a pound.

$$\frac{6}{16}$$

$$\frac{6}{16} = \frac{3}{8}$$

2. What part is 6 of 18? 9 of 36? 12 of 54?
3. What part of a foot is 5 in.? 8 in.? 9 in.? 11 in.?
4. What part of a gallon is 2 qt.? 3 qt.? 5 pt.? 6 pt.?
5. What part of a dollar is 30¢? 50¢? 80¢? 90¢?
6. Jack had 4 apples. What part of a dozen was that?

On this page we have been comparing numbers by division. When numbers are compared by division, the answer is called a *ratio*.

7. What is the ratio of: 4 to 6? 15 to 45? 20 to 75?
8. Ronald had 35¢ and Allan had 70¢. What is the ratio of Ronald's money to Allan's?

FINDING THE WHOLE WHEN A PART IS KNOWN

In Miss Smith's Grade VI class there are 20 boys. This is $\frac{5}{8}$ of the pupils in her class. How many pupils are there in Miss Smith's class?

To find out, we must find a number when we know that $\frac{5}{8}$ of the number is 20.

$$\frac{5}{8} \text{ of the pupils in the class} = 20$$

$$\frac{1}{8} \text{ of the pupils in the class} = \frac{20}{5} = 4$$

$$\frac{8}{8} \text{ of the pupils in the class} = 8 \times 4 = 32$$

So there are 32 pupils in Miss Smith's class.

$$\text{Check: } \frac{5}{8} \text{ of } 32 = \frac{5}{\cancel{8}^4} \times \cancel{32}_1 = 20.$$

Be sure to check each answer.

1. If $\frac{2}{3}$ of a number is 12, what is the number?
2. If $\frac{5}{8}$ of a number is 25, what is the number?
3. "On this trip I used 10 gal. of gasoline," said Mr. Fraser. "That is $\frac{5}{6}$ of what the tank of my car holds." How many gallons does the tank hold?
4. When Elsie had learned 24 of last week's spellings she said, "Now I know $\frac{2}{3}$ of the spellings." How many spellings did Elsie have altogether last week?
5. When Fred went to visit his grandmother he travelled 18 mi. by bus. If this was $\frac{3}{5}$ of the distance, how far did he have to travel to visit his grandmother?
6. Mrs. Baxter paid 45¢ for $\frac{3}{4}$ of a pound of bacon. How much would she have paid if she had bought 1 lb.?
7. If $\frac{2}{3}$ of a bushel of potatoes cost 80¢, how much would a bushel cost?
8. Elmer picked $\frac{3}{8}$ of a gal. of raspberries and sold them for 60¢. At that rate how much would a gallon of raspberries cost?

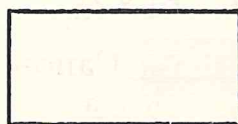
FRACTIONS USED IN BUSINESS

Business men use fractions a great deal. They frequently speak and think of the fractional parts of a dollar. Below you see the fractional parts of a dollar most commonly used in business. Memorize the table both ways: " $\frac{1}{2}$ of \$1 = 50¢" and " $50¢ = \frac{1}{2}$ of \$1", etc.

$\$ \frac{1}{2} = 50¢$	$\$ \frac{1}{5} = 20¢$	$\$ \frac{1}{8} = 12\frac{1}{2}¢$
$\$ \frac{1}{4} = 25¢$	$\$ \frac{2}{5} = 40¢$	$\$ \frac{3}{8} = 37\frac{1}{2}¢$
$\$ \frac{3}{4} = 75¢$	$\$ \frac{3}{5} = 60¢$	$\$ \frac{5}{8} = 62\frac{1}{2}¢$
$\$ \frac{1}{3} = 33\frac{1}{3}¢$	$\$ \frac{4}{5} = 80¢$	$\$ \frac{7}{8} = 87\frac{1}{2}¢$
$\$ \frac{2}{3} = 66\frac{2}{3}¢$	$\$ \frac{1}{6} = 16\frac{2}{3}¢$	$\$ \frac{1}{10} = 10¢$

Sometimes, *but not always*, we can find the answer to a multiplication problem by using the fraction of a dollar rather than the cents. Look at the example below.

Find the cost of 35 books at 40¢ each.
Change 40¢ to $\$ \frac{2}{5}$. Multiply $\$ \frac{2}{5} \times 35$ as shown.
So the cost of 35 books is \$14.



When the fractional part of a dollar is used in multiplying, the answer is in dollars.

Multiply using the fractional parts of a dollar.

- $18 \times 50¢$ $12 \times 33\frac{1}{3}¢$ $56 \times 12\frac{1}{2}¢$
- $32 \times 25¢$ $60 \times 16\frac{2}{3}¢$ $16 \times 75¢$
- $45 \times 80¢$ $24 \times 37\frac{1}{2}¢$ $40 \times 62\frac{1}{2}¢$
- $65 \times 60¢$ $48 \times 87\frac{1}{2}¢$ $200 \times 20¢$

5. A grocer says that "Green Peas" cost him $12\frac{1}{2}¢$ a can. How much would he pay for a case of peas which holds 48 cans?

PRACTICE IN MULTIPLICATION AND DIVISION OF FRACTIONS

Multiply.

Cancel when possible. Check each exercise.

1. $4 \times \frac{3}{5}$

$12 \times \frac{1}{16}$

$\frac{5}{12} \times 13$

$\frac{7}{8} \times 32$

2. $6 \times \frac{5}{8}$

$\frac{3}{10} \times 35$

$20 \times \frac{1}{6}$

$\frac{7}{16} \times 40$

3. $\frac{7\frac{1}{3}}{5}$

$\frac{9\frac{5}{6}}{6}$

$\frac{8\frac{1}{12}}{4}$

$\frac{12}{5\frac{3}{4}}$

$\frac{11}{7\frac{2}{5}}$

$\frac{7}{4\frac{1}{12}}$

4. $\frac{2}{3} \times \frac{1}{5}$

$\frac{3}{4} \times \frac{5}{6}$

$\frac{2}{7} \times \frac{7}{10}$

$\frac{3}{16} \times \frac{8}{9}$

5. $\frac{7}{12} \times 6\frac{3}{5}$

$5\frac{1}{3} \times \frac{1}{8}$

$\frac{3}{5} \times 2\frac{1}{2}$

$\frac{5}{8} \times 1\frac{3}{5}$

6. $4\frac{1}{2} \times \frac{1}{6}$

$\frac{3}{4} \times 1\frac{7}{9}$

$2\frac{1}{2} \times 3\frac{1}{3}$

$6\frac{2}{3} \times 2\frac{1}{10}$

7. $1\frac{1}{4} \times 4\frac{2}{5}$

$4\frac{1}{8} \times 2\frac{2}{9}$

$8\frac{4}{5} \times 2\frac{1}{12}$

$2\frac{5}{7} \times 10\frac{1}{2}$

8. $2\frac{2}{3} \times 2\frac{1}{4}$

$5\frac{2}{5} \times 9\frac{1}{3}$

$4\frac{1}{6} \times 7\frac{1}{10}$

$1\frac{1}{3} \times 5\frac{5}{8}$

9. $6\frac{1}{4} \times 2\frac{1}{5}$

$4\frac{1}{2} \times 2\frac{7}{12}$

$2\frac{3}{16} \times 3\frac{3}{7}$

$1\frac{7}{8} \times 6\frac{2}{5}$

Divide.

Cancel when possible. Check each exercise.

10. $12 \div \frac{3}{10}$

$9 \div \frac{5}{8}$

$10 \div 2\frac{1}{2}$

$4 \div 5\frac{1}{2}$

11. $\frac{7}{8} \div 4$

$\frac{9}{16} \div 6$

$\frac{1}{4} \div 5$

$\frac{9}{10} \div 9$

12. $5\frac{3}{8} \div 3$

$6\frac{2}{5} \div 4$

$1\frac{7}{12} \div 5$

$2\frac{1}{4} \div 6$

13. $\frac{1}{3} \div \frac{1}{12}$

$\frac{7}{8} \div \frac{3}{16}$

$\frac{4}{5} \div \frac{5}{6}$

$\frac{3}{10} \div \frac{3}{4}$

14. $6\frac{2}{3} \div \frac{5}{6}$

$3\frac{1}{8} \div \frac{2}{3}$

$3\frac{3}{10} \div \frac{3}{5}$

$4\frac{2}{5} \div \frac{1}{2}$

15. $\frac{3}{4} \div 1\frac{1}{3}$

$\frac{3}{10} \div 2\frac{1}{2}$

$\frac{1}{5} \div 1\frac{1}{4}$

$\frac{1}{2} \div 1\frac{7}{8}$

16. $13\frac{1}{2} \div 2\frac{1}{4}$

$4\frac{7}{8} \div 2\frac{1}{6}$

$1\frac{2}{3} \div 2\frac{2}{5}$

$1\frac{3}{10} \div 1\frac{1}{2}$

17. $8 \div \frac{2}{3}$

$\frac{7}{12} \div 14$

$\frac{1}{5} \div 9$

$2\frac{2}{3} \div 4$

18. $\frac{1}{3} \div \frac{5}{6}$

$\frac{15}{16} \div \frac{3}{4}$

$4\frac{1}{5} \div \frac{7}{8}$

$\frac{3}{10} \div 1\frac{4}{5}$

19. $\frac{7}{9} \div 2\frac{1}{3}$

$8\frac{1}{4} \div 1\frac{5}{6}$

$4\frac{3}{8} \div 2\frac{1}{2}$

$1\frac{1}{3} \div 2\frac{1}{2}$

KEEPING THE TOOLS SHARP

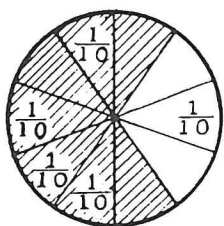
Add. Each exercise must be in lowest terms.

1. $4\frac{1}{5}$ $7\frac{3}{4}$ $1\frac{1}{6}$ $2\frac{5}{6}$ $8\frac{3}{4}$ $7\frac{4}{5}$
 $\underline{2\frac{4}{5}}$ $\underline{1\frac{3}{4}}$ $\underline{6\frac{1}{12}}$ $\underline{8\frac{2}{3}}$ $\underline{6\frac{1}{3}}$ $\underline{5\frac{1}{4}}$
2. $3\frac{5}{12}$ $6\frac{3}{8}$ $11\frac{3}{4}$ $13\frac{3}{10}$ $1\frac{7}{12}$ $8\frac{3}{4}$
 $\underline{2\frac{11}{12}}$ $\underline{3\frac{11}{16}}$ $\underline{5\frac{1}{6}}$ $\underline{1\frac{5}{8}}$ $\underline{5\frac{1}{6}}$ $\underline{4\frac{1}{2}}$
3. $5\frac{7}{10}$ $9\frac{3}{10}$ $4\frac{2}{3}$ $5\frac{5}{8}$ $1\frac{9}{20}$ $10\frac{3}{5}$
 $\underline{4\frac{1}{10}}$ $\underline{5\frac{1}{5}}$ $\underline{6\frac{7}{10}}$ $\underline{7\frac{5}{6}}$ $\underline{9\frac{2}{5}}$ $\underline{2\frac{2}{3}}$
4. $6\frac{3}{4}$ $2\frac{2}{3}$ $8\frac{3}{5}$ $2\frac{7}{8}$ $3\frac{13}{16}$ $11\frac{5}{6}$
 $\underline{7\frac{3}{10}}$ $\underline{6\frac{4}{15}}$ $\underline{3\frac{1}{2}}$ $\underline{5\frac{7}{10}}$ $\underline{7\frac{1}{4}}$ $\underline{3\frac{1}{5}}$
5. $3\frac{1}{2}$ $1\frac{1}{2}$ $4\frac{5}{12}$ $2\frac{5}{8}$ $9\frac{9}{10}$ $3\frac{3}{10}$
 $\underline{1\frac{9}{16}}$ $\underline{1\frac{1}{3}}$ $\underline{4\frac{9}{10}}$ $\underline{9\frac{1}{3}}$ $\underline{3\frac{1}{6}}$ $\underline{4\frac{11}{12}}$

Subtract. Each exercise must be in lowest terms.

6. $3\frac{5}{8}$ $6\frac{1}{3}$ 2 $9\frac{11}{16}$ $12\frac{3}{10}$ $13\frac{3}{5}$
 $\underline{1\frac{3}{8}}$ $\underline{4\frac{2}{3}}$ $\underline{\frac{1}{6}}$ $\underline{3\frac{1}{2}}$ $\underline{7\frac{4}{5}}$ $\underline{8\frac{1}{2}}$
7. $5\frac{9}{10}$ 4 $3\frac{5}{6}$ $5\frac{1}{4}$ $12\frac{5}{6}$ $2\frac{1}{8}$
 $\underline{2\frac{7}{10}}$ $\underline{\frac{3}{4}}$ $\underline{2\frac{11}{12}}$ $\underline{3\frac{2}{5}}$ $\underline{9\frac{1}{4}}$ $\underline{\frac{1}{5}}$
8. $7\frac{5}{16}$ $5\frac{3}{8}$ $8\frac{4}{5}$ $12\frac{5}{6}$ $4\frac{1}{6}$ 8
 $\underline{2\frac{9}{16}}$ $\underline{1\frac{3}{4}}$ $\underline{7\frac{5}{8}}$ $\underline{9\frac{1}{4}}$ $\underline{3\frac{3}{8}}$ $\underline{\frac{5}{12}}$
9. $6\frac{1}{16}$ $4\frac{1}{12}$ $6\frac{7}{8}$ $18\frac{1}{6}$ $6\frac{7}{9}$ $9\frac{2}{3}$
 $\underline{3\frac{5}{8}}$ $\underline{\frac{1}{6}}$ $\underline{1\frac{3}{10}}$ $\underline{9\frac{3}{4}}$ $\underline{3\frac{1}{3}}$ $\underline{8\frac{7}{10}}$
10. $11\frac{3}{5}$ $7\frac{1}{10}$ $11\frac{1}{2}$ $14\frac{1}{3}$ $17\frac{3}{10}$ $11\frac{7}{8}$
 $\underline{6\frac{9}{10}}$ $\underline{\frac{1}{12}}$ $\underline{5\frac{5}{8}}$ $\underline{7\frac{4}{5}}$ $\underline{7\frac{1}{6}}$ $\underline{4\frac{11}{12}}$

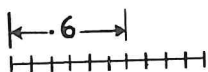
A NEW WAY TO WRITE TENTHS



The circle on the left is divided into 10 *equal* parts. Each part is $\frac{1}{10}$ of the circle. $\frac{7}{10}$ of the circle is shaded. $\frac{7}{10}$ means 7 of the 10 equal parts of the circle.

A new way to write $\frac{7}{10}$ is .7 and .7 is read "*seven-tenths*" because it means the same as $\frac{7}{10}$.

We call .7 a *decimal fraction*, and the (.) is called a *decimal point*.



The line on the left is 1 in. long. If you count the divisions you will see that the line is divided into 10 equal parts. Each part is $\frac{1}{10}$ in. Six of the parts are $\frac{6}{10}$ in. Another way to write $\frac{6}{10}$ is .6 and .6 is read "six-tenths" because it means the same as $\frac{6}{10}$. We call .6 a decimal fraction.

- Write these common fractions as decimal fractions:

$$\frac{3}{10}, \quad \frac{5}{10}, \quad \frac{2}{10}, \quad \frac{8}{10}, \quad \frac{1}{10}, \quad \frac{9}{10}, \quad \frac{4}{10}$$

- Read these decimal fractions:

$$.2, \quad .4, \quad .8, \quad .5, \quad .1, \quad .9, \quad .6, \quad .3, \quad .7, \quad .8$$

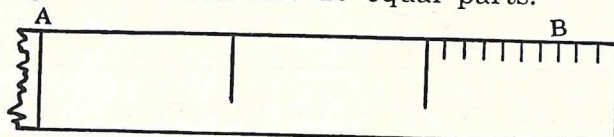
- Read these sentences:

- Fred lives .4 of a mile from school.
- Ice is .9 as heavy as water.
- The board was .5 in. thick.
- Bill ate .3 of the chocolate bar.

Remember: When tenths are written as decimal fractions, there is one figure after the decimal point.

MIXED DECIMALS

The measure below is divided into inches. The inch on the right is divided into 10 equal parts.



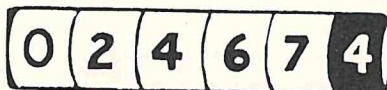
$$2\frac{7}{10} = 2.7$$

The distance from A to B is $2\frac{7}{10}$ in. A new way to write $2\frac{7}{10}$ is 2.7 which is read "two and seven tenths".

We call 2.7 a *mixed decimal* because it is part whole number and part decimal fraction.

In a mixed decimal the decimal point is read "and".

The total distance an automobile has travelled is shown on the mileage indicator. The total mileage on the indicator on the right

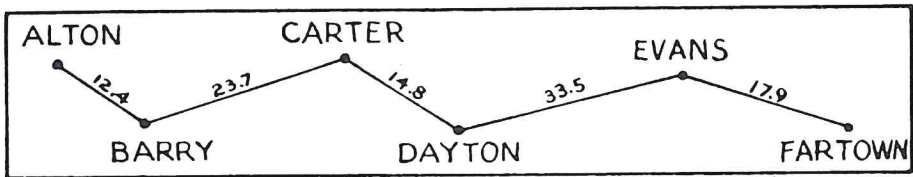


is 2467.4 mi. The number on the right (which is usually coloured red) tells the tenths of a mile the automobile has travelled. 2467.4 is a *mixed decimal* and is read, "two thousand four hundred sixty seven and four tenths."

Read these mixed decimals:

1. 5.6, 14.2, 95.7, 161.5, 385.9, 806.4, 1672.8.
2. Change these to mixed decimals:
 $4\frac{3}{10}$, $9\frac{1}{10}$, $16\frac{7}{10}$, $83\frac{2}{10}$, $156\frac{9}{10}$, $287\frac{4}{10}$.
3. Read these sentences:
 - (a) The distance from Truro to Halifax is 63.7 mi.
 - (b) The record for 100 yd. on roller skates is 9.7 sec.
 - (c) Normal body temperature is 98.6 degrees.
 - (d) The snow fall one day in February was 11.3 in.
 - (e) A quart of water weighs about 2.5 lb.

MIXED DECIMALS IN EVERYDAY LIFE



1. The road map above gives the distances in miles between towns on the highway between Alton and Fartown. Start at Alton and go to Fartown. Before you leave a town tell how far it is to the next town.

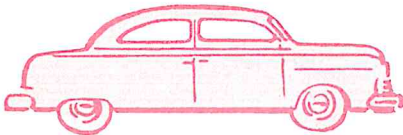


2. The sign on the left tells how far it is to Galt. How far is it?



3. On the left you see the reading on the speedometer of Mr. Arthur's car. How many miles has his car gone?

Here are some mixed decimals as used in everyday life.

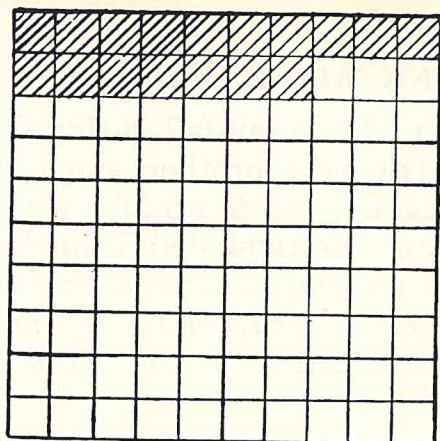


4. Jack's father returned from an automobile trip yesterday. He said he drove at an average rate of 38.4 mi. per hour, and that he averaged 19.7 mi. to a gallon of gasoline.

5. The weather bureau reported that the temperature on July 7 was 92.1 degrees.

6. An all-time low temperature for this continent of 78.7 degrees below zero was recorded near the Alaska-Yukon border on Jan. 29, 1947.





A NEW WAY TO WRITE HUNDREDTHS

The square on the left is divided into 100 equal parts. Each part is $\frac{1}{100}$ (one hundredth) of the whole square. 17 parts are shaded; that is $\frac{17}{100}$ (seventeen hundredths) of the square are shaded.

A new way to write $\frac{17}{100}$ is .17 and .17 is read "seventeen hundredths" because it means the same as $\frac{17}{100}$.

We call .17 a *decimal fraction*.

Remember: When hundredths are written as decimal fractions there are two figures after the decimal point.

Read these decimal fractions. Show each on the square.

1. .13, .28, .41, .67, .35, .74, .91, .56, .86

Write these common fractions as decimal fractions:

2. $\frac{19}{100}$; $\frac{37}{100}$; $\frac{55}{100}$; $\frac{43}{100}$; $\frac{77}{100}$; $\frac{93}{100}$; $\frac{21}{100}$; $\frac{64}{100}$

Write as decimal fractions:

3. thirty-six hundredths; sixty-one hundredths; eighty-seven hundredths; fourteen hundredths.

Look at the square above again. Count off $\frac{7}{100}$. We write $\frac{7}{100}$ as a decimal fraction this way, .07, because when we have *hundredths* we must have *two figures* after the decimal point. But the 7 of seven-hundredths gives us only one figure, so we must put a zero before it because we must have two figures after the decimal point in hundredths. The zero in .07 shows there are no tenths.

Read these decimal fractions. Show each on the square:

4. .06, .02, .08, .01, .09, .04, .05, .03

Write these common fractions as decimal fractions:

5. $\frac{3}{100}$; $\frac{7}{100}$; $\frac{4}{100}$; $\frac{1}{100}$; $\frac{5}{100}$; $\frac{8}{100}$; $\frac{6}{100}$; $\frac{2}{100}$; $\frac{9}{100}$

READING AND WRITING MIXED DECIMALS

Tom read in a newspaper that the rainfall during the month of May was 4.63 in. His older brother said that 4.63 is a *mixed decimal* because it is made up of a whole number and a decimal fraction. He reminded Tom that *the decimal point in a mixed decimal is always read as "and"*. The way to read 4.63 is "*four and sixty-three hundredths*". The way to read 251.03 is *two hundred fifty-one and three hundredths*".

Read these mixed decimals:

1. 6.24, 9.05, 84.63, 92.01, 367.85, 604.08
2. 35.71, 111.02, 7.06, 3542.75, 4603.03

Write the following as mixed decimals:

3. Five and thirty-seven hundredths; forty-two and four hundredths; one hundred eighty-nine and sixty-four hundredths; four hundred sixteen and five hundredths.

A dollar is 100 cents, so 1 cent is one hundredth of a dollar. One cent may be written, \$.01. We read \$.52 as "fifty-two cents". It means fifty-two hundredths of a dollar.

4. Read these and tell what each means: \$.26; \$.47; \$.92; \$.05; \$.08; \$.03

Dollars and cents are mixed decimals and the decimal point is read as "and".

5. Read these and tell what each means: \$1.35; \$8.08; \$13.84; \$156.55; \$272.08; \$1693.04

6. Read these sentences and tell what each means:

- (a) Milk is about .87 water.
- (b) A quart of milk weighs 2.58 pounds.
- (c) In a motor-boat race the winning boat averaged 53.29 miles an hour.
- (d) Jim's box is about 11.5 in. long.
- (e) Ice is .92 as heavy as water.

A NEW WAY TO WRITE THOUSANDTHS

Last winter George Bates cut 1000 blocks of ice of the same size and stored them in his ice shed. By the next August he had used 674 blocks or $\frac{674}{1000}$ of his ice.

$\frac{674}{1000}$ is read "six hundred seventy-four thousandths" and means 674 of the 1000 blocks which are all of the same size.

A new way to write $\frac{674}{1000}$ is .674 which is read "*six hundred seventy-four thousandths*" because it means the same as $\frac{674}{1000}$.

We call .674 a *decimal fraction*.

Remember: When thousandths are written as decimal fractions there are three figures after the decimal point.

1. Read these decimal fractions:

.256, .479, .615, .703, .322, .806, .934
.185, .501, .982, .106, .765, .429, .302

2. Write as decimal fractions: $\frac{547}{1000}$, $\frac{135}{100}$, $\frac{602}{1000}$.

The common fraction $\frac{43}{1000}$ is read "forty-three thousandths" and means 43 of the 1000 equal parts into which something is divided.

As a *decimal fraction*, $\frac{43}{1000}$ is written .043 and is read "forty-three thousandths" because it means the same as $\frac{43}{1000}$. The 43 of "forty-three thousandths" gives only two figures, so we put a zero before the 4 because we must have three figures after the decimal point in thousandths.

3. Read: .036, .029, .065, .012, .084, .051
.042, .076, .023, .095, .069, .018

$\frac{4}{1000}$ is read "four thousandths" and means 4 of the 1000 equal parts into which something is divided. As a decimal fraction, $\frac{4}{1000}$ is written .004. It is read "*four-thousandths*" because it means the same as $\frac{4}{1000}$. *Two zeros are written before the 4 to get the three figures after the decimal point needed for thousandths.*

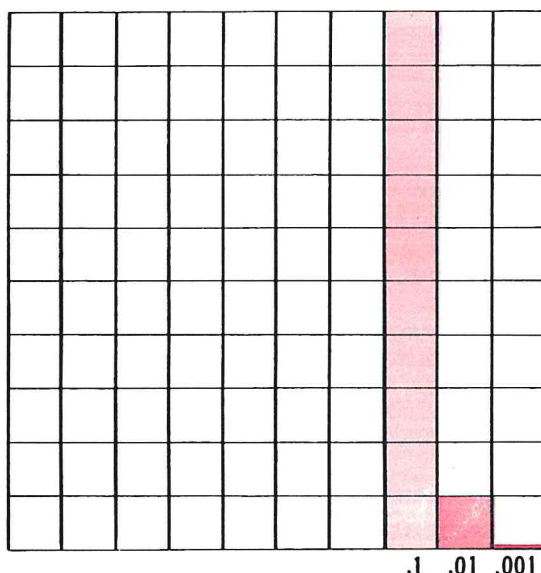
4. Read: .002, .005, .007, .003, .009, .001, .004, .008, .006

COMPARING TENTHS, HUNDREDTHS, AND THOUSANDTHS

This drawing will give an idea of the size of a thousandth compared with a tenth and a hundredth of the same thing.

The heavy lines divide the large squares into tenths. Each part is one-tenth (.1).

The large square is divided into 100 equal parts. Each small square is one-hundredth (.01).



.1 .01 .001

The coloured part in the lower right hand quarter is one-thousandth (.001) of the large square.

Notice →

A tenth is 10 times greater than a hundredth, and a hundredth is 10 times greater than a thousandth.

MORE ABOUT THE MEANING OF DECIMAL FRACTIONS

We know that the decimal fraction .372 means the same as $\frac{372}{1000}$ and is read "three hundred seventy-two thousandths". However, .372 tells us more than *thousandths*. The 3 in .372 means 3 *tenths*; the 7 means 7 *hundredths*; and the 2 means 2 *thousandths*.

So .372 is made up of 3 *tenths*, 7 *hundredths*, and 2 *thousandths*.

1. Tell what each figure means in these decimal fractions:

.45, .72, .06, .09, .154, .729, .038, .002

READING AND WRITING MIXED DECIMALS

253.167 is a *mixed decimal*. It is read "two hundred fifty-three and one hundred sixty-seven thousandths".

In a mixed decimal only the decimal point is read "and".

84.091 is read "eight-four and ninety-one thousandths".

6.003 is read "six and three thousandths".

1. Read: 427.283; 569.037; 2579.431; 1234.065; 39.439; 26.012; 18.001; 7.485; 2.062.

2. Write in figures:

(a) two hundred fifty-three thousandths.

(b) two hundred and fifty-three thousandths.

Decimal fractions and mixed decimals are usually spoken of as decimals.

READING AND WRITING DECIMALS

Read these decimals:

1. .4; .21; .183; .1; .01; .001; .05; .067; .82

2. .574; .306; .095; .003; 7.2; 5.42; 14.07

3. 402.06; 59.015; 267.8; 605.27; 5934.003

Write the following as decimals:

4. (a) two-tenths; (b) eighteen-hundredths; (c) nine-hundredths; (d) one hundred thirty-two thousandths; (e) three thousandths; (f) fifty-four thousandths; (g) twenty-nine and four tenths; (h) two hundred sixty-one and fourteen-hundredths; (i) five hundred four and two hundred twenty-five thousandths.

Read these sentences and tell what each means:

5. The world's record for 440 yd. is 46.3 sec.

6. In May, 1949, Bill Holland won the Indianapolis Auto Race in the record time of 121.377 miles per hour.

7. Mercury is 13.64 times as heavy as water.

8. In many countries the longest measure of length is the kilometer, which is .625 of a mile.

9. A sheet of paper is about .002 in. thick.

OUR DECIMAL NUMBER SYSTEM

Our number system is called the decimal system. The word "decimal" comes from the Latin word "*decem*" which means "*ten*". *So all our numbers are decimals.* Each figure in a number has a place name and value. Each place value is 10 times the place value on the right.

Distinguish between the *decimal* and the *decimal point* (.). *The number is the decimal.*

Look at the number 92457.3681.

ten thousands	thousands	hundreds	tens	ones	tenths	hundredths	thousandths	ten-thousandths
9	2	4	5	7	.	3	6	8 1

Starting at the decimal point and reading to the left we say that 7 is the figure in the *ones'* place and means 7 ones; 5 is the figure in the *tens'* place and means 5 tens or 50; the 4 in the *hundreds'* place means 4 hundreds or 400; the 2 in the *thousands'* place means 2 thousands or 2000, and the 9 in the *ten-thousands'* place means 9 ten-thousands or 90000.

Now starting at the right of the decimal point we say that 3 is the figure in the *tenths'* place and means 3 tenths or .3; 6 in the *hundredths'* place means 6 hundredths or .06; 8 in the *thousandths'* place means 8 thousandths or .008; and 1 in the *ten-thousandths'* place means 1 ten-thousandth or .0001.

Something Important about Decimal Fractions

We know that $\frac{7}{10} = \frac{70}{100} = \frac{700}{1000}$ because $\frac{70}{100}$ and $\frac{700}{1000}$ in lowest terms equal $\frac{7}{10}$.

But $\frac{7}{10} = .7$; $\frac{70}{100} = .70$; and $\frac{700}{1000} = .700$ so $.7 = .70 = .700$

The decimal fractions .7, .70, and .700 have the *same value* but they are expressed in different terms. The .7 is in tenths, the .70 in hundredths, and the .700 in thousandths.

Annexing zeros to the right of a decimal fraction does not change the value of the decimal fraction.

1. Write as hundredths: .5; .2; .8; 6.4; 19.1
2. Write as thousandths: .4; .6; .37; .51; 2.4; 13.81



SALLY IS A SALES GIRL

Sally likes to help in her father's store. Her father says she is as good as his regular clerks because she knows her Arithmetic well. The problems below will tell you what Arithmetic she had to know to be a good clerk.

1. Sally sold Mrs. Donaldson 5 yd. of material to make towels. If each hand towel is to be $\frac{1}{2}$ yd. long, how many towels will Mrs. Donaldson be able to make?

2. There were $12\frac{1}{2}$ yd. of blanched cotton on the counter. If Sally sold $2\frac{3}{4}$ yd. of it to Mrs. Smith, how many yards were left?

3. Mrs. Sullivan bought 3 pairs of stocking at \$1.29 a pair; 4 handkerchiefs at \$.35 each, and $\frac{1}{2}$ yd. of lace at \$.60 a yard. How much did she pay Sally for these?

4. Vera bought $2\frac{1}{2}$ yd. of cotton at \$.52 a yard, and 4 yd. of muslin at \$.48 a yard. How much money did Sally have to get from Vera?

5. Mrs. Graves bought 7 yd. of curtain material. How many curtains $1\frac{3}{4}$ yd. long can she make?

6. How much did Sally charge Mrs. Ball for $1\frac{1}{2}$ doz. buttons at 18¢ a doz., and $3\frac{1}{4}$ yd. of ribbon at 24¢ a yard?

7. Mrs. Reid bought $3\frac{3}{4}$ yd. of cloth for a suit. If she paid \$2.60 a yard for it, how much change would Sally have to give Mrs. Reid from a \$10-bill?

PRACTICE IN MULTIPLICATION AND DIVISION OF FRACTIONS

Multiply. Cancel when possible. Check each exercise.

$$1. \quad 10 \times \frac{3}{8} \qquad 3 \times \frac{2}{7} \qquad \frac{7}{10} \times 4 \qquad \frac{3}{16} \times 2$$

$$2. \quad \frac{9\frac{1}{2}}{3} \qquad \frac{7\frac{2}{3}}{9} \qquad \frac{4\frac{1}{6}}{5} \qquad \frac{15}{6\frac{4}{5}} \qquad \frac{13}{8\frac{1}{4}} \qquad \frac{8}{7\frac{1}{16}}$$

$$3. \quad \frac{1}{4} \times \frac{1}{3} \qquad \frac{3}{10} \times \frac{5}{8} \qquad \frac{3}{16} \times \frac{4}{9} \qquad \frac{5}{12} \times \frac{9}{10}$$

$$4. \quad 2\frac{4}{5} \times \frac{3}{4} \qquad \frac{1}{2} \times 3\frac{2}{3} \qquad \frac{5}{12} \times 3\frac{9}{10} \qquad \frac{7}{10} \times 2\frac{6}{7}$$

$$5. \quad 6\frac{2}{3} \times \frac{1}{8} \qquad 3\frac{3}{7} \times \frac{5}{16} \qquad 4\frac{1}{4} \times 7\frac{1}{2} \qquad 7\frac{3}{8} \times 3\frac{1}{5}$$

$$6. \quad 5\frac{5}{6} \times 4\frac{5}{7} \qquad 8\frac{2}{3} \times 1\frac{7}{8} \qquad 5\frac{3}{5} \times 2\frac{13}{16} \qquad 3\frac{3}{4} \times 3\frac{1}{3}$$

$$7. \quad 24 \times \frac{5}{8} \qquad \frac{2}{3} \times 19 \qquad \frac{1}{8} \times \frac{1}{2} \qquad \frac{4}{5} \times 6\frac{7}{8}$$

$$8. \quad 2\frac{2}{5} \times \frac{9}{16} \qquad 1\frac{7}{8} \times 6\frac{2}{3} \qquad \frac{7}{12} \times 96 \qquad \frac{5}{16} \times \frac{8}{9}$$

$$9. \quad \frac{1}{6} \times 2\frac{4}{7} \qquad 18 \times \frac{3}{4} \qquad 8\frac{1}{3} \times \frac{7}{10} \qquad 10\frac{5}{6} \times 1\frac{4}{5}$$

Divide. Cancel when possible. Check each exercise.

$$10. \quad 4 \div \frac{1}{3} \qquad 8 \div \frac{4}{5} \qquad 7 \div 1\frac{1}{3} \qquad 2 \div 2\frac{2}{5}$$

$$11. \quad \frac{3}{10} \div 2 \qquad \frac{8}{9} \div 6 \qquad \frac{1}{8} \div 4 \qquad \frac{7}{12} \div 7$$

$$12. \quad 4\frac{1}{6} \div 2 \qquad 6\frac{3}{10} \div 3 \qquad 2\frac{2}{3} \div 5 \qquad 2\frac{2}{5} \div 4$$

$$13. \quad \frac{4}{5} \div \frac{4}{15} \qquad \frac{3}{4} \div \frac{2}{3} \qquad \frac{9}{16} \div \frac{3}{4} \qquad \frac{5}{8} \div \frac{2}{3}$$

$$14. \quad 3\frac{3}{4} \div \frac{3}{8} \qquad 2\frac{1}{2} \div \frac{2}{5} \qquad 5\frac{1}{6} \div \frac{3}{4} \qquad 2\frac{5}{12} \div \frac{5}{8}$$

$$15. \quad \frac{4}{5} \div 1\frac{1}{2} \qquad \frac{7}{16} \div 1\frac{3}{4} \qquad \frac{1}{4} \div 1\frac{3}{5} \qquad \frac{1}{8} \div 2\frac{1}{4}$$

$$16. \quad 13\frac{1}{2} \div 3\frac{3}{8} \qquad 3\frac{1}{2} \div 1\frac{2}{5} \qquad 2\frac{1}{3} \div 3\frac{1}{5} \qquad 1\frac{1}{4} \div 3\frac{1}{3}$$

$$17. \quad 9 \div \frac{3}{8} \qquad \frac{3}{16} \div 3 \qquad 10 \div 1\frac{1}{3} \qquad 4\frac{1}{2} \div 9$$

$$18. \quad 1\frac{1}{3} \div \frac{1}{4} \qquad \frac{7}{8} \div \frac{5}{6} \qquad 1\frac{1}{4} \div 2\frac{1}{12} \qquad 6\frac{3}{4} \div 3$$

$$19. \quad \frac{1}{5} \div 5 \qquad \frac{7}{12} \div 3\frac{1}{3} \qquad 3\frac{9}{10} \div 1\frac{1}{5} \qquad \frac{7}{9} \div 5\frac{5}{6}$$

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	2981	3629	5745	437	8075
	5349	2406	126	7089	5122
	6207	3274	9799	2525	7964
	8985	1603	501	866	1199
	7447	9830	7682	8716	4070
	<u>1815</u>	<u>5957</u>	<u>927</u>	<u>3808</u>	<u>3324</u>

Subtract. Check each exercise.

2.	49263	98371	25228	96495	82460
	<u>29683</u>	<u>52924</u>	<u>16627</u>	<u>49497</u>	<u>12598</u>
3.	81300	60803	80627	47531	97428
	<u>57756</u>	<u>57027</u>	<u>61665</u>	<u>17749</u>	<u>48789</u>
4.	96742	77256	82741	63000	53424
	<u>86865</u>	<u>69487</u>	<u>78783</u>	<u>27002</u>	<u>47759</u>

Multiply. Check each answer.

5.	4273	7852	6237	2906	6098
	<u>5</u>	<u>4</u>	<u>7</u>	<u>8</u>	<u>3</u>
6.	95	85	347	1609	2047
	<u>70</u>	<u>69</u>	<u>82</u>	<u>56</u>	<u>94</u>
7.	562	704	470	895	658
	<u>418</u>	<u>526</u>	<u>300</u>	<u>710</u>	<u>609</u>

Divide. Check each exercise.

8.	34) <u>14790</u>	92) <u>53564</u>	57) <u>42096</u>	38) <u>20767</u>
9.	65) <u>31680</u>	16) <u>11016</u>	75) <u>25543</u>	86) <u>35002</u>
10.	184) <u>76544</u>	627) <u>93525</u>	493) <u>267489</u>	

COMPARING DECIMAL FRACTIONS

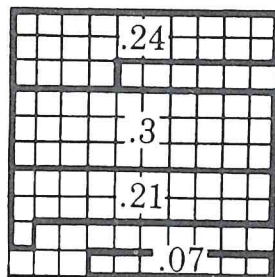
Which is the larger, 723 or 698? We know at once that 723 is the larger. Now let us see why. The number 723 has 7 *hundreds*, 2 *tens*, and 3 *ones*. The number 698 has 6 *hundreds* 9 *tens*, and 8 *ones*. But *hundreds are greater than tens*, and *tens are greater than ones*. So the number with the more hundreds is the larger.

The number which has the larger figure in the greatest place value *on the left* is the larger.

It is just as easy to compare decimal fractions. Just remember that each figure in a decimal fraction has a place value, and that *tenths are greater than hundredths*, and *hundredths are greater than thousandths*.

Arrange in order of size from the largest to the smallest: .24, .3, .07, .21

Look at the figure on the left of each decimal fraction. The decimal fraction with the most tenths is .3, so .3 is the largest. Now .24 and .21 each have two tenths but .24 has 4 hundredths and .21 has only 1 hundredth. So .24 is the next largest. .21 is next largest because .07 has no tenths.



So in order of size from largest to smallest the decimal fractions should be arranged: .3, .24, .21, .07. Look at the drawing to see comparative sizes of these decimal fractions.

1. Which is the larger: .47 or .51? .257 or .229? .036 or .115?
2. Which is the smaller: .29 or .31? .019 or .021?
3. Arrange in order of size from the largest to the smallest: (a) .179, .25, .4, .191 (b) .602, .51, .009, .6 (c) .42, .069, .071, .354, .5, .356.
4. One piece of steel is .327 in. thick, and another is .331 in. thick. Which is the thicker?

ADDING DECIMALS

A proper supply of rain is necessary to farmers if they are to have good crops. This year in Egton, a farming community, the rainfall in May was 4.21 in.; in June, 3.06 in.; and in July 1.78 in. What was the total rainfall for the three months? To find the total rainfall for the three months we *add*.

We add decimals as we add dollars and cents.

4.21

3.06

1.78

9.05

Write the numbers as shown with the decimal points directly under each other.

Add the numbers.

Put a decimal point in the answer directly under the decimal points above.

So the total rainfall for the three months was 9.05 in.

Add. Check each exercise.

- | | | | | | |
|----|------------|------------|-------------|--------------|--------------|
| 1. | 4.2 | 5.4 | 8.13 | 43.15 | 5.364 |
| | 7.2 | 7.2 | 3.74 | 52.58 | 8.804 |
| | 6.1 | 4.6 | 4.04 | 37.63 | 3.267 |
| | <u>2.3</u> | <u>7.7</u> | <u>2.65</u> | <u>26.87</u> | <u>4.720</u> |
| 2. | 6.3 | 4.5 | 9.42 | 27.63 | 2.874 |
| | 4.8 | 9.4 | 7.73 | 3.53 | 6.546 |
| | 6.2 | 5.7 | 5.05 | 38.38 | .702 |
| | 8.5 | 6.2 | 4.50 | 54.04 | 4.374 |
| | <u>5.3</u> | <u>6.6</u> | <u>6.93</u> | <u>6.12</u> | <u>4.606</u> |

Copy these and add:

3. $5.6 + 3.2 + 2.2 + 6.0 + 4.4$

4. $4.63 + 4.09 + 6.95 + 3.53 + 5.24$

5. $63.17 + 9.42 + 51.34 + 18.82 + 2.72$

6. Four boys, Tom, Jack, Pete, and Roy, ran the 440 yd. relay race for their school at the track meet. Each boy ran 110 yd. Tom ran his distance in 13.5 sec.; Jack in 13.8 sec.; Pete in 12.9 sec.; and Roy in 12.4 sec. How long did it take the boys to run the relay race?

ADDING DECIMALS

When adding decimals we must be very careful not only to keep the decimal points directly under each other, but also to keep *tenths* under *tenths*, *hundredths* under *hundredths*, etc.

In resurfacing a highway, .4 mi. was done on Monday, .3 mi. on Tuesday, and .5 mi. on Wednesday. How many miles were resurfaced on the three days?

To find how many miles were resurfaced we *add*.

$\begin{array}{r} .4 \\ .3 \\ .5 \\ \hline 1.2 \end{array}$	Write the decimal fractions as shown. Add. The sum is 12 tenths which is one whole and 2 tenths or 1.2. Notice that the 2 tenths is written under the tenths and the 1 whole in the ones' place to the left of the decimal point.	$\begin{array}{r} \frac{4}{10} \\ \frac{3}{10} \\ \frac{5}{10} \\ \hline \frac{12}{10} = 1\frac{2}{10} \end{array}$
---	---	---

On the right you see the answer is the same when the tenths are written as common fractions.

So 1.2 mi. of the pavement was resurfaced.

Be sure there is a <u>zero</u>	<u>.05</u>	<u>.054</u>	<u>.003</u>
in each <u>empty place</u>	<u>.02</u>	<u>.032</u>	<u>.006</u>
after the decimal point.	<u>.07</u>	<u>.086</u>	<u>.009</u>

Add and check.

- | | | | | | |
|---|---|--|--|--|--|
| 1. $\begin{array}{r} .2 \\ .5 \\ .1 \\ \hline \end{array}$ | 2. $\begin{array}{r} .6 \\ .3 \\ .5 \\ \hline \end{array}$ | 3. $\begin{array}{r} .8 \\ .5 \\ .6 \\ \hline \end{array}$ | 4. $\begin{array}{r} .38 \\ .29 \\ .16 \\ \hline \end{array}$ | 5. $\begin{array}{r} .04 \\ .02 \\ .02 \\ \hline \end{array}$ | 6. $\begin{array}{r} .05 \\ .07 \\ .06 \\ \hline \end{array}$ |
| 1. $\begin{array}{r} .31 \\ .55 \\ .62 \\ \hline \end{array}$ | 2. $\begin{array}{r} .46 \\ .65 \\ .77 \\ \hline \end{array}$ | 3. $\begin{array}{r} .023 \\ .054 \\ .012 \\ \hline \end{array}$ | 4. $\begin{array}{r} .001 \\ .005 \\ .003 \\ \hline \end{array}$ | 5. $\begin{array}{r} .007 \\ .006 \\ .009 \\ \hline \end{array}$ | 6. $\begin{array}{r} .279 \\ .645 \\ .704 \\ \hline \end{array}$ |

Copy these and add:

- | | |
|----------------------|----------------------------|
| 3. $.3 + .6 + .4$ | 4. $.23 + .65 + .01 + .52$ |
| 5. $.01 + .03 + .02$ | 6. $.06 + .08 + .09$ |
7. To get to school yesterday, Bill walked .5 mi.; ran .3 mi.; and got a ride .6 mi. How far does Bill live from the school?

SUBTRACTING DECIMALS

The Curran family have a new car. When they left on a week-end holiday the speedometer read 348.7 mi. When they got home again the speedometer read 516.3 mi. How many miles did they travel on their trip?

To find how many miles they travelled we *subtract* 348.7 from 516.3.

516.3
348.7
167.6

We subtract decimals as we subtract dollars and cents.

Write the numbers as shown with the decimal points directly under each other.

Subtract the numbers.

Put a decimal point in the answer directly under the decimal points above.

So the Curran family travelled 167.6 mi.

Subtract. Check each answer.

- | | | | | |
|--|--|--|--|---|
| 1. $\begin{array}{r} 5.4 \\ 3.1 \\ \hline \end{array}$ | 2. $\begin{array}{r} 9.7 \\ 6.2 \\ \hline \end{array}$ | 3. $\begin{array}{r} 3.86 \\ 2.53 \\ \hline \end{array}$ | 4. $\begin{array}{r} 75.87 \\ 43.24 \\ \hline \end{array}$ | 5. $\begin{array}{r} 6.972 \\ 2.351 \\ \hline \end{array}$ |
| 1. $\begin{array}{r} 8.685 \\ 4.632 \\ \hline \end{array}$ | 2. $\begin{array}{r} 4.84 \\ 2.63 \\ \hline \end{array}$ | 3. $\begin{array}{r} 76.9 \\ 64.7 \\ \hline \end{array}$ | 4. $\begin{array}{r} 9.397 \\ 2.351 \\ \hline \end{array}$ | 5. $\begin{array}{r} 4.753 \\ 4.351 \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 7.2 \\ 4.4 \\ \hline \end{array}$ | 8.3 $\begin{array}{r} 8.3 \\ 5.6 \\ \hline \end{array}$ | 5.04 $\begin{array}{r} 5.04 \\ 3.18 \\ \hline \end{array}$ | 62.25 $\begin{array}{r} 62.25 \\ 35.67 \\ \hline \end{array}$ | 8.016 $\begin{array}{r} 8.016 \\ 4.458 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} 6.801 \\ 4.968 \\ \hline \end{array}$ | \$5.42 $\begin{array}{r} \$5.42 \\ 4.87 \\ \hline \end{array}$ | \$9.30 $\begin{array}{r} \$9.30 \\ 3.69 \\ \hline \end{array}$ | 52.507 $\begin{array}{r} 52.507 \\ 27.736 \\ \hline \end{array}$ | 8.148 $\begin{array}{r} 8.148 \\ 7.679 \\ \hline \end{array}$ |

Copy these and subtract:

5. $8.6 - 7.5$ 6. $9.1 - 4.4$ 7. $9.38 - 2.56$
 8. $6.74 - 5.99$ 9. $7.486 - 5.652$ 10. $42.612 - 33.875$

11. Last Christmas Day 4.85 in. of snow fell during the morning and 6.27 in. fell during the evening. How many inches more snow fell in the evening than in the morning?

SUBTRACTING DECIMALS

When subtracting decimals be careful not only to keep the decimal points directly under each other, but also to keep *tenths* under *tenths*; *hundredths* under *hundredths*, etc.

Jack Reid is a machinist. In his work he has to be very accurate in measuring. Yesterday he measured the thickness of two pieces of steel. One piece was .65 in. and the other, .47 in. What was the difference in the thickness of the pieces?

To find the difference in thickness we *subtract*.

$$\begin{array}{r} .65 \\ -.47 \\ \hline .18 \end{array}$$

Write the decimal fractions as shown, and subtract.

Notice that 8 hundredths is written under the hundredths and 1 tenth under the tenths.

$$\begin{array}{r} \frac{65}{100} \\ -\frac{47}{100} \\ \hline \frac{18}{100} \end{array}$$

On the right you see the answer is the same when the decimal fractions are written as common fractions. So the difference in the thickness was .18 in.

Be sure there is a zero	.08	.15	.076	.137	.006
in each empty place	.03	.09	.032	.092	.005
after the decimal point.	.05	.06	.044	.045	.001

Subtract.

Check each exercise.

- | | | | | | |
|---|--|--|--|--|--|
| 1. $\begin{array}{r} .7 \\ -.3 \\ \hline \end{array}$ | $\begin{array}{r} .45 \\ -.23 \\ \hline \end{array}$ | $\begin{array}{r} .96 \\ -.24 \\ \hline \end{array}$ | $\begin{array}{r} .61 \\ -.44 \\ \hline \end{array}$ | $\begin{array}{r} .658 \\ -.226 \\ \hline \end{array}$ | $\begin{array}{r} .954 \\ -.637 \\ \hline \end{array}$ |
| 2. $\begin{array}{r} .07 \\ -.04 \\ \hline \end{array}$ | $\begin{array}{r} .05 \\ -.01 \\ \hline \end{array}$ | $\begin{array}{r} .08 \\ -.02 \\ \hline \end{array}$ | $\begin{array}{r} .12 \\ -.05 \\ \hline \end{array}$ | $\begin{array}{r} .16 \\ -.09 \\ \hline \end{array}$ | $\begin{array}{r} .11 \\ -.08 \\ \hline \end{array}$ |
| 3. $\begin{array}{r} .049 \\ -.015 \\ \hline \end{array}$ | $\begin{array}{r} .074 \\ -.016 \\ \hline \end{array}$ | $\begin{array}{r} .067 \\ -.039 \\ \hline \end{array}$ | $\begin{array}{r} .053 \\ -.036 \\ \hline \end{array}$ | $\begin{array}{r} .127 \\ -.064 \\ \hline \end{array}$ | $\begin{array}{r} .164 \\ -.079 \\ \hline \end{array}$ |
| 4. $\begin{array}{r} .348 \\ -.259 \\ \hline \end{array}$ | $\begin{array}{r} .526 \\ -.458 \\ \hline \end{array}$ | $\begin{array}{r} .713 \\ -.667 \\ \hline \end{array}$ | $\begin{array}{r} .005 \\ -.004 \\ \hline \end{array}$ | $\begin{array}{r} .009 \\ -.003 \\ \hline \end{array}$ | $\begin{array}{r} .007 \\ -.002 \\ \hline \end{array}$ |

5. An iron washer was .13 in. thick. If .05 in. is filed off the washer, how thick will it be then?

SUBTRACTING A DECIMAL FROM A WHOLE NUMBER

The longest measure of length used in this country is the mile. In many other countries the longest measure of length is the kilometer, which is .625 mi. How much longer is 1 mile than 1 kilometer?

To find out how much longer 1 mile is than 1 kilometer we subtract .625 from 1.

$$\begin{array}{r} 1.000 \\ -.625 \\ \hline .375 \end{array}$$

Put a decimal point after the whole number and annex as many zeros as there are decimal places in the number to be subtracted.

Subtract.

Put a decimal point in the answer directly under the decimal points above.

So 1 mi. is .375 mi. longer than 1 kilometer.

Tell how
these
are done.



4.0	6.00	3.000	5.000
<u>.3</u>	<u>.51</u>	<u>1.004</u>	<u>4.932</u>
3.7	5.49	1.996	.068

Check, subtract, and check each exercise.

- | | | |
|-----------------|------------------|-----------------|
| 1. $2 - .6$ | 2. $17 - 2.8$ | 3. $1 - .47$ |
| 4. $3 - .04$ | 5. $4 - 3.16$ | 6. $8 - .391$ |
| 7. $15 - .075$ | 8. $6 - .004$ | 9. $1 - .862$ |
| 10. $1 - .053$ | 11. $1 - .007$ | 12. $7 - 4.684$ |
| 13. $9 - 8.263$ | 14. $12 - 7.017$ | 15. $6 - 5.048$ |

Watch the Zeros in Decimals

1. Annexing zeros to the right of a decimal does not change the value of the decimal. $.7 = .70 = .700$
2. Dropping zeros at the right of the last figure in a decimal does not change the value of the decimal. $.50 = .5$
3. When adding or subtracting decimals fill the empty places between the decimal point and the first figure on the right with zeros.
4. Putting a zero to the left of the decimal point in a decimal fraction does not change its value. $.6 = 0.6$



PROBLEMS USING ADDITION AND SUBTRACTION OF DECIMALS

1. Tony and Dick were the best batters on the school baseball team. Tony's batting average was .342 and Dick's was .329. How much higher was Tony's average?

2. Susan kept a very accurate record of the distance travelled each day on the family automobile trip. The first day they travelled 293.4 mi.; the second day, 186.9 mi.; and the third day, 257.8 mi. How many miles did they travel in the three days?

3. Roy's father's car has 7.74 in. ground clearance; Neil's father's car has 7.25 in. ground clearance. How many more inches clearance has Roy's father's car?

4. When Mr. Gogan bought his automobile he was told that he should get 23 mi. to a gallon of gasoline. On a trip he found he got only 19.4 mi. to a gallon. How many fewer miles to a gallon did he get than he expected?

5. The temperature at 8 a.m. on Easter Sunday was 39.7° . During the next two hours the temperature rose 15.6° . What was the temperature at 10 a.m.?

6. Mr. Fraser had a contract to build 5 mi. of highway. When .7 mi. was completed, how many miles remained to be done?

7. Four sheets of tin were piled flat on top of each other. If the sheets were .049 in.; .037 in.; .052 in.; and .061 in. thick, how thick was the pile?

DIAGNOSTIC TEST IN DECIMALS

The work below will test you on the kinds of examples you should know this far in decimals. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

READING DECIMALS					Page
1. .3	.29	.06	.524		148
2. .019	.002	8.7	14.32		to
3. 5.01	7.305	262.049	1243.008		156
WRITING AS DECIMALS					
4. (a) eight-tenths	(b) sixty-five hundredths				148
(c) three hundred twenty-eight thousandths					to
(d) two and six-tenths	(e) nineteen and fifty-three hundredths				156
(f) one hundred and five-hundredths	(g) twenty-six and seventy-two thousandths				
(h) eleven and four-thousandths.					
ADDING DECIMALS					
5. $\begin{array}{r} 3.54 \\ 8.97 \\ \hline 5.06 \end{array}$	$\begin{array}{r} 1.426 \\ 9.373 \\ \hline 4.627 \end{array}$	$\begin{array}{r} .5 \\ .6 \\ \hline .8 \end{array}$	$\begin{array}{r} .32 \\ .17 \\ \hline .26 \end{array}$	$\begin{array}{r} .03 \\ .04 \\ \hline .02 \end{array}$	161
6. $\begin{array}{r} .06 \\ .08 \\ \hline .04 \end{array}$	$\begin{array}{r} .247 \\ .325 \\ \hline .188 \end{array}$	$\begin{array}{r} .014 \\ .035 \\ \hline .038 \end{array}$	$\begin{array}{r} .002 \\ .004 \\ \hline .003 \end{array}$	$\begin{array}{r} .563 \\ .865 \\ \hline .694 \end{array}$	162
SUBTRACTING DECIMALS					
7. $\begin{array}{r} 6.1 \\ 2.4 \\ \hline \end{array}$	$\begin{array}{r} 83.45 \\ 45.26 \\ \hline \end{array}$	$\begin{array}{r} 9.613 \\ 5.867 \\ \hline \end{array}$	$\begin{array}{r} .8 \\ .2 \\ \hline \end{array}$	$\begin{array}{r} .54 \\ .36 \\ \hline \end{array}$	
8. $\begin{array}{r} .462 \\ .137 \\ \hline \end{array}$	$\begin{array}{r} .09 \\ .04 \\ \hline \end{array}$	$\begin{array}{r} .13 \\ .05 \\ \hline \end{array}$	$\begin{array}{r} .086 \\ .073 \\ \hline \end{array}$	$\begin{array}{r} .127 \\ .068 \\ \hline \end{array}$	163
9. $\begin{array}{r} .434 \\ .365 \\ \hline \end{array}$	$\begin{array}{r} .751 \\ .668 \\ \hline \end{array}$	$\begin{array}{r} .008 \\ .003 \\ \hline \end{array}$	$\begin{array}{r} .15 \\ .09 \\ \hline \end{array}$	$\begin{array}{r} .152 \\ .088 \\ \hline \end{array}$	164
10. 3 - .52	11. 1 - .037	12. 6 - 5.124			165

THE MEANING OF MULTIPLYING A DECIMAL BY A WHOLE NUMBER

At the Boy Scout's camp .3 bu. of potatoes were used each day. How many bushels were used in 3 days?

We can find the answer in three different ways.

- I. *By adding* II. *By multiplying a common fraction* III. *By multiplying a decimal fraction*

$$\begin{array}{r} .3 \\ .3 \\ .3 \\ \hline .9 \end{array}$$

$$3 \times \frac{3}{10} = \frac{9}{10}$$

.3
× 3
.9

We get the same answer each time. Notice that when the decimal fraction .3 is multiplied by 3, *we multiply the numbers and mark off from the right in the product one decimal place because there is one decimal place in the multiplicand.* When we multiply tenths the product will be tenths.

So .9 bu. of potatoes were used in three days.

Alfie lives 1.6 mi. from school. How far does he walk each day if he walks this distance 4 times a day?

- I. *By adding* II. *By multiplying a mixed fraction* III. *By multiplying a decimal*

$$\begin{array}{r} 1.6 \\ 1.6 \\ 1.6 \\ 1.6 \\ \hline 6.4 \end{array}$$

$$\begin{aligned} 4 \times 1\frac{6}{10} &= 4 \times \frac{16}{10} \\ &= \frac{64}{10} = 6\frac{4}{10} \end{aligned}$$

1.6
× 4
6.4

The answers are all the same, so Alfie walks 6.4 mi. Notice that when the decimal 1.6 is multiplied by 4, *we multiply the numbers and mark off from the right in the product one decimal place because there is one decimal place in the multiplicand.*

THE MEANING OF MULTIPLYING A DECIMAL BY A WHOLE NUMBER

The rain-fall on 3 successive days was .24 in. How many inches of rain fell during the 3 days?

We find the answer in three different ways.

- I. *By adding* II. *By multiplying a common fraction* III. *By multiplying a decimal fraction*

.24

.24

.24

.72

$$3 \times \frac{24}{100} = \frac{72}{100}$$

.24
× 3
.72

The answers are the same, so .72 in. of rain fell. Notice that when the decimal fraction .72 is multiplied by 3, *we multiply the numbers and mark off from the right in the product two decimal places because there are two decimal places in the multiplicand.* When we multiply hundredths the product will be hundredths.

If 3 pieces of steel plate are each .258 in. thick, how thick will the pile be if they are placed on top of each other?

We find the answer in three different ways.

- I. *By adding* II. *By multiplying a common fraction* III. *By multiplying a decimal fraction*

.258

.258

.258

.774

$$3 \times \frac{258}{1000} = \frac{774}{1000}$$

.258
× 3
.774

The answers are the same. So the pile will be .774 in. thick. Notice that when the decimal fraction .258 is multiplied by 3, *we multiply the numbers and mark off from the right in the product three decimal places because there are three decimal places in the multiplicand.* When we multiply thousandths the product will be thousandths.

THE MEANING OF MULTIPLYING A DECIMAL BY A WHOLE NUMBER

From the work on page 168 and page 169 we discover the following rule.

Rule: To multiply a decimal by a whole number, multiply the numbers and mark off from the right in the product as many decimal places as there are in the multiplicand.

Multiply. Check each answer.

- | | | | | | | | |
|--|---|---|---|---|---|--|--|
| 1. $\begin{array}{r} .3 \\ 2 \\ \hline \end{array}$ | $\begin{array}{r} .2 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} .1 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} .5 \\ 3 \\ \hline \end{array}$ | $\begin{array}{r} .8 \\ 6 \\ \hline \end{array}$ | $\begin{array}{r} .9 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} .6 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} .7 \\ 5 \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 1.4 \\ 3 \\ \hline \end{array}$ | $\begin{array}{r} 2.3 \\ 5 \\ \hline \end{array}$ | $\begin{array}{r} 3.7 \\ 6 \\ \hline \end{array}$ | $\begin{array}{r} 5.8 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} 6.7 \\ 9 \\ \hline \end{array}$ | $\begin{array}{r} 3.6 \\ 8 \\ \hline \end{array}$ | | |
| 3. $\begin{array}{r} .29 \\ 3 \\ \hline \end{array}$ | $\begin{array}{r} .14 \\ 6 \\ \hline \end{array}$ | $\begin{array}{r} .39 \\ 2 \\ \hline \end{array}$ | $\begin{array}{r} .69 \\ 5 \\ \hline \end{array}$ | $\begin{array}{r} .83 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} .52 \\ 9 \\ \hline \end{array}$ | | |
| 4. $\begin{array}{r} 3.47 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} 6.52 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} 5.19 \\ 5 \\ \hline \end{array}$ | $\begin{array}{r} 9.54 \\ 8 \\ \hline \end{array}$ | $\begin{array}{r} 28.49 \\ 9 \\ \hline \end{array}$ | $\begin{array}{r} 19.62 \\ 6 \\ \hline \end{array}$ | | |
| 5. $\begin{array}{r} .317 \\ 2 \\ \hline \end{array}$ | $\begin{array}{r} .276 \\ 3 \\ \hline \end{array}$ | $\begin{array}{r} .192 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} .473 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} .852 \\ 16 \\ \hline \end{array}$ | $\begin{array}{r} .687 \\ 25 \\ \hline \end{array}$ | | |
| 6. $\begin{array}{r} 1.439 \\ 5 \\ \hline \end{array}$ | $\begin{array}{r} 2.675 \\ 7 \\ \hline \end{array}$ | $\begin{array}{r} 4.937 \\ 6 \\ \hline \end{array}$ | $\begin{array}{r} 6.013 \\ 4 \\ \hline \end{array}$ | $\begin{array}{r} 12.345 \\ 9 \\ \hline \end{array}$ | $\begin{array}{r} 20.783 \\ 8 \\ \hline \end{array}$ | | |
| 7. $\begin{array}{r} 6.8 \\ 12 \\ \hline \end{array}$ | $\begin{array}{r} 28.5 \\ 35 \\ \hline \end{array}$ | $\begin{array}{r} 3.62 \\ 46 \\ \hline \end{array}$ | $\begin{array}{r} 4.07 \\ 29 \\ \hline \end{array}$ | $\begin{array}{r} 3.276 \\ 158 \\ \hline \end{array}$ | $\begin{array}{r} 15.469 \\ 73 \\ \hline \end{array}$ | | |

8. A quart of milk weighs 2.58 lb. How many pounds will 4 gallons of milk weigh?

MULTIPLYING A WHOLE NUMBER BY A DECIMAL

The average speed of the Flying Express is 35 mi. an hour.
How far will it travel in 4.5 hr.?

$$\begin{array}{r} 35 \\ 4.5 \\ \hline 175 \\ 140 \\ \hline 157.5 \end{array}$$

To find how far it will travel we *multiply* 35 by 4.5.

Write the numbers as shown on the left.

Multiply as with whole numbers.

Mark off from the right in the product *one* decimal place because there is *one* decimal place in the multiplier.

$$\begin{array}{r} 35 \\ \times 4.5 \\ \hline 175 \\ 140 \\ \hline 157.5 \end{array}$$

On the right we see we get the same answer when 4.5 is written as $4\frac{5}{10}$.

So the train will travel 157.5 mi. in 4.5 hr.

Tell how these are done.



			26	567
			.18	.126
2	7			
.3	.4		2 08	3 402
.6	2.8		2 6	11 34
			4.68	56 7
				71.442

Rule: To multiply a whole number by a decimal, multiply the numbers and mark off from the right in the product as many decimal places as there are in the multiplier.

Multiply.

Check each answer.

1.	$\begin{array}{r} 2 \\ .2 \\ \hline \end{array}$	$\begin{array}{r} 2 \\ .4 \\ \hline \end{array}$	$\begin{array}{r} 9 \\ .5 \\ \hline \end{array}$	$\begin{array}{r} 8 \\ .7 \\ \hline \end{array}$	$\begin{array}{r} 24 \\ .6 \\ \hline \end{array}$	$\begin{array}{r} 92 \\ .3 \\ \hline \end{array}$	$\begin{array}{r} 37 \\ .8 \\ \hline \end{array}$
----	--	--	--	--	---	---	---

2.	$\begin{array}{r} 47 \\ 2.5 \\ \hline \end{array}$	$\begin{array}{r} 53 \\ 4.3 \\ \hline \end{array}$	$\begin{array}{r} 78 \\ 6.9 \\ \hline \end{array}$	$\begin{array}{r} 36 \\ .17 \\ \hline \end{array}$	$\begin{array}{r} 67 \\ .38 \\ \hline \end{array}$	$\begin{array}{r} 143 \\ .65 \\ \hline \end{array}$
----	--	--	--	--	--	---

3.	$\begin{array}{r} 478 \\ 14.2 \\ \hline \end{array}$	$\begin{array}{r} 724 \\ 35.7 \\ \hline \end{array}$	$\begin{array}{r} 619 \\ 4.16 \\ \hline \end{array}$	$\begin{array}{r} 459 \\ 2.83 \\ \hline \end{array}$	$\begin{array}{r} 614 \\ 5.79 \\ \hline \end{array}$	$\begin{array}{r} 508 \\ 6.41 \\ \hline \end{array}$
----	--	--	--	--	--	--

4.	$\begin{array}{r} 618 \\ .123 \\ \hline \end{array}$	$\begin{array}{r} 538 \\ .354 \\ \hline \end{array}$	$\begin{array}{r} 529 \\ .354 \\ \hline \end{array}$	$\begin{array}{r} 327 \\ .519 \\ \hline \end{array}$	$\begin{array}{r} 846 \\ .486 \\ \hline \end{array}$	$\begin{array}{r} 905 \\ .792 \\ \hline \end{array}$
----	--	--	--	--	--	--

5. Milk is about .92 water. About how many gallons of water are there in 28 gal. of milk?

MULTIPLYING DECIMALS BY 10, 100, AND 1000

Study each of the examples below.

The decimal is multiplied by 10. $10 \times 2.4 = 24.$

What happens to the decimal point?

$$\begin{array}{r} 2.4 \\ \times 10 \\ \hline 24.0 \end{array}$$

The decimal is multiplied by 100. $100 \times 2.4 = 240.$

What happens to the decimal point? Why is a zero annexed?

$$\begin{array}{r} 2.4 \\ \times 100 \\ \hline 240.0 \end{array}$$

The decimal is multiplied by 1000. $1000 \times 2.4 = 2400.$

What happens to the decimal point? Why are two zeros annexed?

$$\begin{array}{r} 2.4 \\ \times 1000 \\ \hline 2400.0 \end{array}$$

Tell how these are done.



$$10 \times 4.27 = 42.7$$

$$100 \times 4.27 = 427$$

$$1000 \times 4.27 = 4270$$

To multiply a decimal by 10, move the decimal point one place to the right; to multiply a decimal by 100, move the decimal point two places to the right; to multiply a decimal by 1000, move the decimal point three places to the right. Annex zeros to the right of the last figure if necessary.

Multiply each of these decimals by 10.

1. 3.25 8.1 2.467 .6 .9

Multiply each of these decimals by 100.

2. 5.72 16.3 4.365 .5 .2

Multiply each of the decimals by 1000.

3. 8.142 28.15 6.1 .3 .7

4. How much will 10 tons of coal cost at \$12.85 a ton?

5. If the average weight of 100 turkeys is 11.5 lb., what is their total weight?

6. A meter is a measure which is 39.37 in. long. How many inches are there in 100 meters?



SHOVELLING SNOW

Most people enjoy a snow storm. The whole countryside is made beautiful by a blanket of pure white snow. Children love to play in the snow and older boys earn pocket money by shovelling the neighbours' walks.

1. One day in January snow fell for 5 hours. If 2.4 in. of snow fell each hour what was the total snow fall that day?

2. Bill worked $2\frac{1}{2}$ hr. shovelling people's walks and Roy worked $3\frac{1}{3}$ hr. How much longer did Roy work than Bill?

3. It took Tony $2\frac{3}{4}$ hr. to shovel the walks at Dr. Smith's house. Dr. Smith paid Tony 40¢ an hour and Tony spent 15¢ for hot chocolate after he finished his job. How much money did Tony take home?

4. The sidewalk in front of Gordon's home is 47 ft. long and 4 ft. wide; the walk to the house is 23 ft. long and 5 ft. wide. If Gordon shovelled both walks how many square feet did he clean?

5. Allan shovelled a walk 62 ft. long and $3\frac{1}{2}$ ft. wide; and Peter shovelled one $50\frac{3}{4}$ ft. long and 4 ft. wide. Which walk had the greater area? How much greater?

6. The average yearly total snow fall in Sydney is 97.9 in. Last year the total snow fall in Sydney was 104.3 in. How many inches more was that than the average?

KEEPING THE TOOLS SHARP

Add. Check each answer.

1.	7565	6354	5799	1826	2374
X	3892	8979	4172	9069	5751
	1067	3603	5546	4791	8808
	8355	5427	9269	8260	7499
	6848	3944	1072	3134	2851
	<u>7790</u>	<u>6724</u>	<u>4366</u>	<u>9683</u>	<u>4917</u>

Subtract. Check each answer.

2.	14553	12312	91256	27747	84234
	<u>9270</u>	<u>7804</u>	<u>40808</u>	<u>19357</u>	<u>52568</u>
X 3.	52485	82641	93573	33835	62456
	<u>43693</u>	<u>46959</u>	<u>65597</u>	<u>13898</u>	<u>54477</u>
4.	28520	56070	70402	40001	30000
	<u>19784</u>	<u>36205</u>	<u>20907</u>	<u>15032</u>	<u>20026</u>

Multiply. Check each answer.

5.	4879	3568	2759	5806	1087
	<u>6</u>	<u>8</u>	<u>5</u>	<u>7</u>	<u>9</u>
6.	84	69	94	394	607
	<u>40</u>	<u>29</u>	<u>86</u>	<u>17</u>	<u>58</u>
7.	648	586	872	498	756
X	<u>275</u>	<u>483</u>	<u>500</u>	<u>390</u>	<u>106</u>
					<u>971</u>
					<u>807</u>

Divide. Check each answer.

8.	93) <u>85374</u>	48) <u>31556</u>	16) <u>11576</u>	24) <u>19564</u>
X 9.	85) <u>30600</u>	36) <u>16932</u>	53) <u>42653</u>	67) <u>20502</u>
10.	439) <u>67328</u>	182) <u>64457</u>	726) <u>148830</u>	

KEEPING THE TOOLS SHARP

Add. Each answer must be in lowest terms.

$$\begin{array}{r} 1. \quad 3\frac{2}{3} \\ \underline{1\frac{2}{3}} \end{array} \quad \begin{array}{r} 6\frac{3}{10} \\ \underline{2\frac{9}{10}} \end{array} \quad \begin{array}{r} 4\frac{5}{8} \\ \underline{5\frac{3}{8}} \end{array} \quad \begin{array}{r} 7\frac{5}{12} \\ \underline{3\frac{1}{2}} \end{array} \quad \begin{array}{r} 2\frac{1}{6} \\ \underline{8\frac{1}{3}} \end{array} \quad \begin{array}{r} 2\frac{7}{16} \\ \underline{2\frac{5}{16}} \end{array}$$

$$\begin{array}{r} 2. \quad 3\frac{2}{5} \\ \underline{9\frac{1}{3}} \end{array} \quad \begin{array}{r} 12\frac{1}{2} \\ \underline{5\frac{4}{5}} \end{array} \quad \begin{array}{r} 8\frac{5}{6} \\ \underline{5\frac{3}{4}} \end{array} \quad \begin{array}{r} 2\frac{1}{4} \\ \underline{8\frac{7}{10}} \end{array} \quad \begin{array}{r} 5\frac{7}{8} \\ \underline{6\frac{3}{4}} \end{array} \quad \begin{array}{r} 1\frac{9}{16} \\ \underline{2\frac{1}{2}} \end{array}$$

$$\begin{array}{r} 3. \quad 10\frac{2}{3} \\ \underline{6\frac{3}{10}} \end{array} \quad \begin{array}{r} 7\frac{3}{4} \\ \underline{4\frac{2}{5}} \end{array} \quad \begin{array}{r} 1\frac{3}{8} \\ \underline{1\frac{5}{6}} \end{array} \quad \begin{array}{r} 5\frac{1}{10} \\ \underline{9\frac{7}{8}} \end{array} \quad \begin{array}{r} 7\frac{1}{2} \\ \underline{6\frac{5}{6}} \end{array} \quad \begin{array}{r} 8\frac{7}{10} \\ \underline{4\frac{4}{5}} \end{array}$$

$$\begin{array}{r} 4. \quad 11\frac{1}{2} \\ \underline{8\frac{2}{3}} \end{array} \quad \begin{array}{r} 1\frac{9}{16} \\ \underline{9\frac{3}{8}} \end{array} \quad \begin{array}{r} 9\frac{1}{6} \\ \underline{5\frac{7}{12}} \end{array} \quad \begin{array}{r} 8\frac{5}{6} \\ \underline{7\frac{3}{10}} \end{array} \quad \begin{array}{r} 3\frac{1}{5} \\ \underline{4\frac{1}{4}} \end{array} \quad \begin{array}{r} 7\frac{2}{3} \\ \underline{8\frac{7}{12}} \end{array}$$

$$\begin{array}{r} 5. \quad 3\frac{3}{4} \\ \underline{6\frac{3}{16}} \end{array} \quad \begin{array}{r} 15\frac{7}{12} \\ \underline{5\frac{9}{10}} \end{array} \quad \begin{array}{r} 13\frac{1}{6} \\ \underline{2\frac{4}{5}} \end{array} \quad \begin{array}{r} 5\frac{7}{10} \\ \underline{4\frac{1}{12}} \end{array} \quad \begin{array}{r} 6\frac{1}{8} \\ \underline{3\frac{3}{10}} \end{array} \quad \begin{array}{r} 9\frac{5}{6} \\ \underline{11\frac{2}{5}} \end{array}$$

Subtract. Each answer must be in lowest terms.

$$\begin{array}{r} 6. \quad 5\frac{3}{4} \\ \underline{2\frac{1}{4}} \end{array} \quad \begin{array}{r} 3\frac{2}{5} \\ \underline{1\frac{4}{5}} \end{array} \quad \begin{array}{r} 6 \\ \underline{\frac{3}{8}} \end{array} \quad \begin{array}{r} 8\frac{1}{3} \\ \underline{4\frac{1}{2}} \end{array} \quad \begin{array}{r} 11\frac{1}{5} \\ \underline{7\frac{9}{10}} \end{array} \quad \begin{array}{r} 10\frac{4}{5} \\ \underline{6\frac{1}{2}} \end{array}$$

$$\begin{array}{r} 7. \quad 4\frac{5}{6} \\ \underline{3\frac{1}{6}} \end{array} \quad \begin{array}{r} 9 \\ \underline{\frac{7}{10}} \end{array} \quad \begin{array}{r} 5\frac{3}{10} \\ \underline{3\frac{1}{2}} \end{array} \quad \begin{array}{r} 4\frac{2}{3} \\ \underline{2\frac{3}{5}} \end{array} \quad \begin{array}{r} 7\frac{1}{4} \\ \underline{5\frac{1}{6}} \end{array} \quad \begin{array}{r} 2 \\ \underline{\frac{11}{16}} \end{array}$$

$$\begin{array}{r} 8. \quad 7\frac{1}{2} \\ \underline{4\frac{7}{12}} \end{array} \quad \begin{array}{r} 8\frac{3}{4} \\ \underline{6\frac{7}{8}} \end{array} \quad \begin{array}{r} 9\frac{1}{5} \\ \underline{3\frac{1}{4}} \end{array} \quad \begin{array}{r} 16\frac{9}{10} \\ \underline{9\frac{3}{8}} \end{array} \quad \begin{array}{r} 10\frac{1}{3} \\ \underline{5\frac{5}{12}} \end{array} \quad \begin{array}{r} 11\frac{1}{4} \\ \underline{8\frac{1}{3}} \end{array}$$

$$\begin{array}{r} 9. \quad 8\frac{7}{12} \\ \underline{3\frac{1}{10}} \end{array} \quad \begin{array}{r} 3\frac{1}{8} \\ \underline{\frac{7}{16}} \end{array} \quad \begin{array}{r} 10\frac{2}{5} \\ \underline{1\frac{5}{6}} \end{array} \quad \begin{array}{r} 9\frac{2}{3} \\ \underline{7\frac{11}{15}} \end{array} \quad \begin{array}{r} 12\frac{7}{10} \\ \underline{7\frac{1}{6}} \end{array} \quad \begin{array}{r} 13\frac{1}{3} \\ \underline{\frac{5}{8}} \end{array}$$

$$\begin{array}{r} 10. \quad 2\frac{5}{16} \\ \underline{1\frac{3}{4}} \end{array} \quad \begin{array}{r} 5\frac{5}{12} \\ \underline{4\frac{5}{6}} \end{array} \quad \begin{array}{r} 6\frac{7}{8} \\ \underline{2\frac{4}{5}} \end{array} \quad \begin{array}{r} 19\frac{3}{4} \\ \underline{9\frac{5}{6}} \end{array} \quad \begin{array}{r} 15\frac{1}{8} \\ \underline{6\frac{5}{12}} \end{array} \quad \begin{array}{r} 11\frac{11}{12} \\ \underline{\frac{9}{10}} \end{array}$$

THE MEANING OF MULTIPLYING A DECIMAL BY A DECIMAL

Jean's mother had .5 gal. of ice-cream. She served .3 of what she had to Jean's friends. How much of a gallon did she serve?

To find how much she served we find .3 of .5 or $.3 \times .5$. We can find the answer in two ways.

I. *By multiplying the common fractions*

$$\frac{3}{10} \times \frac{5}{10} = \frac{15}{100}$$

II. *By multiplying the decimal fractions*

.5	(one place)
.3	(one place)
<u>.15</u>	(two places)

We get the same answer each time.

Notice that when we multiply the decimal fraction .5 by the decimal fraction .3 we multiply the numbers and mark off from the right in the product *two* decimal places because there is *one* decimal place in the multiplicand and *one* decimal place in the multiplier.

So Jean's mother served .15 gal. of ice-cream.

Multiply .63 by .7.

We can find the answer in two ways.

I. *By multiplying the common fractions*

$$\frac{7}{10} \times \frac{63}{100} = \frac{441}{1000}$$

II. *By multiplying the decimal fractions*

.63	(2 places)
.7	(1 place)
<u>.441</u>	(3 places)

We get the same answer each time.

Look at the multiplication of decimals above. How many decimal places in the multiplicand? How many decimal places in the multiplier? How many decimal places in the product? Can you tell why?

MULTIPLYING A DECIMAL BY A DECIMAL

Rule: To multiply a decimal by a decimal, multiply the numbers and mark off from the right in the product as many decimal places as there are decimal places in both the multiplicand and the multiplier.

Mr. Hall's new car averaged 19.5 mi. on a gallon of gasoline. How far will his car go on 6.5 gallons?

To find how far the car will go we *multiply* 19.5 by 6.5.

Multiply the numbers.

There is *one* decimal place in the multiplicand, and *one* decimal place in the multiplier. Hence there must be *two* decimal places in the product. From the right in the product mark off *two* decimal places.

So the car will go 126.75 miles.

$$\begin{array}{r} 19.5 \\ \times 6.5 \\ \hline 975 \\ 1170 \\ \hline 126.75 \end{array}$$

Multiply. Check each answer.

1. $\begin{array}{r} .5 \\ \times .3 \\ \hline \end{array}$	$\begin{array}{r} .7 \\ \times .6 \\ \hline \end{array}$	$\begin{array}{r} .9 \\ \times .8 \\ \hline \end{array}$	$\begin{array}{r} .46 \\ \times .7 \\ \hline \end{array}$	$\begin{array}{r} .39 \\ \times .9 \\ \hline \end{array}$	$\begin{array}{r} .82 \\ \times .6 \\ \hline \end{array}$
---	--	--	---	---	---

2. $\begin{array}{r} .421 \\ \times .8 \\ \hline \end{array}$	$\begin{array}{r} .345 \\ \times .5 \\ \hline \end{array}$	$\begin{array}{r} .207 \\ \times .9 \\ \hline \end{array}$	$\begin{array}{r} .56 \\ \times .40 \\ \hline \end{array}$	$\begin{array}{r} .73 \\ \times .37 \\ \hline \end{array}$	$\begin{array}{r} .82 \\ \times .54 \\ \hline \end{array}$
---	--	--	--	--	--

3. $\begin{array}{r} 7.6 \\ \times 2.4 \\ \hline \end{array}$	$\begin{array}{r} 9.2 \\ \times 3.2 \\ \hline \end{array}$	$\begin{array}{r} 18.7 \\ \times 1.5 \\ \hline \end{array}$	$\begin{array}{r} 1.24 \\ \times 2.7 \\ \hline \end{array}$	$\begin{array}{r} 3.68 \\ \times 7.4 \\ \hline \end{array}$	$\begin{array}{r} 6.53 \\ \times 8.6 \\ \hline \end{array}$
---	--	---	---	---	---

4. $\begin{array}{r} 15.5 \\ \times 6.7 \\ \hline \end{array}$	$\begin{array}{r} 49.6 \\ \times .3 \\ \hline \end{array}$	$\begin{array}{r} 3.78 \\ \times .7 \\ \hline \end{array}$	$\begin{array}{r} 26.49 \\ \times 1.5 \\ \hline \end{array}$	$\begin{array}{r} 4.56 \\ \times .96 \\ \hline \end{array}$	$\begin{array}{r} 5.73 \\ \times .48 \\ \hline \end{array}$
--	--	--	--	---	---

5. $\begin{array}{r} 43.6 \\ \times 12.7 \\ \hline \end{array}$	$\begin{array}{r} 5.29 \\ \times 2.40 \\ \hline \end{array}$	$\begin{array}{r} .863 \\ \times 13.4 \\ \hline \end{array}$	$\begin{array}{r} .904 \\ \times 3.16 \\ \hline \end{array}$	$\begin{array}{r} .617 \\ \times .58 \\ \hline \end{array}$	$\begin{array}{r} .408 \\ \times .90 \\ \hline \end{array}$
---	--	--	--	---	---

6. Mrs. Tweed bought 4.5 lb. of beef at \$.50 a pound. How much did she pay for the beef?

7. What is the cost of 3.25 yd. of window screening at \$.60 a yard?

YOU MAY NEED ZEROS IN THE PRODUCT

Multiply .3 by .2.

$$\frac{2}{10} \times \frac{3}{10} = \frac{6}{100}$$

.3	(one place)
.2	(one place)
<u>.06</u>	(two places)

When we multiply the numbers 3 and 2 the product is the one figure number 6. But we *must* have two decimal places in the product. So a zero is placed before the 6 to make two decimal places in the product.

Multiply .04 by .2.

I. $\frac{2}{10} \times \frac{4}{100} = \frac{8}{1000}$

II.

.04	(two places)
.2	(one place)
<u>.008</u>	(three places)

When we multiply the numbers 4 and 2 the product is the one figure 8. But we *must* have three decimal places in the product. Why? So two zeros are placed before the 8 to make three decimal places in the product.

When the product has fewer figures in it than the number of decimal places needed, insert as many zeros as are required to give the number of decimal places needed. Insert the zeros from the right to the left and put a decimal point before the last zero inserted.

Multiply. Check each answer.

1.	.2	.2	.3	.1	.03	.01	.01
	<u>.2</u>	<u>.3</u>	<u>.3</u>	<u>.6</u>	<u>.3</u>	<u>.5</u>	<u>.1</u>

2.	.13	.23	.15	.17	.64	.83
	<u>.4</u>	<u>.3</u>	<u>.5</u>	<u>.4</u>	<u>.1</u>	<u>.1</u>

The four-place decimal fraction .0065 is read, "sixty-five *ten-thousandths*".

3.	.08	.09	.03	.012	.087	.002
	<u>.03</u>	<u>.06</u>	<u>.02</u>	<u>.4</u>	<u>.3</u>	<u>.2</u>

ESTIMATING THE ANSWER

In multiplying decimals we may sometimes get an answer that is *unreasonable*. We can avoid this if we *estimate* the answer before we do the work. Then we can compare the answer we get with the estimated answer. This will help us to get *reasonable answers*. Study the examples below.

1. Multiply 19.24 by 6

19.24
 $\underline{\quad 6 \quad}$
 Think, "19.24 is about the same as 19, and $6 \times 19 = 114$. So the answer will be about 114. Now, do the work as shown on the right. The product 115.44 is

19.24
$\underline{\quad 6 \quad}$
115.44

about the same as 114, so the answer is *reasonable*. To make sure it is correct, check the work.

2. Multiply 41 by 2.8

41
 $\underline{2.8}$
 Think, "2.8 is about the same as 3, and $3 \times 41 = 123$. So the answer will be about 123." Now do the work as shown on the right. The product 114.8 is close enough to 123 to be a *reasonable* answer. To make sure it is correct, check the work.

41
$\underline{2.8}$
328
$\underline{82}$
114.8

3. Multiply 6.9 by 3.1

6.9
 $\underline{3.1}$
 Think, "6.9 is about 7 and 3.1 is about 3. $3 \times 7 = 21$. So the answer will be about 21." Now do the work as shown on the right. The product 21.37 is about 21, so the answer is *reasonable*. To make sure it is correct, check the work.

6.9
$\underline{3.1}$
69
$\underline{207}$
21.39

4. Multiply .7 by .4

.7
 $\underline{.4}$
 Think, ".7 is less than 1; and .4 is less than 1. Since $1 \times 1 = 1$, the answer will be less than 1." Do the work as shown on the right. The answer is *reasonable* because it is less than 1. To make sure it is correct check the work.

.7
$\underline{.4}$
.28

Multiply. Estimate the answer before you do the work. Be sure the answer is reasonable.

- | | | | | | |
|-----------------|-------------------|-------------------|------------------|-------------------|-------------------|
| 1. 6.19 | $\underline{26}$ | 8.2 | .9 | 4.76 | 28.7 |
| $\underline{4}$ | $\underline{3.9}$ | $\underline{5.8}$ | $\underline{.6}$ | $\underline{5.1}$ | $\underline{2.7}$ |



PROBLEMS USING MULTIPLICATION OF DECIMALS

1. Last year the average amount of butter eaten by each Canadian was 33.1 lb. Using this average how many pounds of butter would the family of 5 persons shown above eat last year?
2. A rod is 16.5 ft. long. How many feet in 20 rods?
3. In many countries a measure of weight called the kilogram is used. A kilogram is about 2.2 pounds. How many pounds in 75 kilograms?
4. If Mr. Smith averaged 38.6 mi. an hour on his last motor trip, how far did he travel in 3.5 hr.?
5. Mr. Robinson is buying his house by paying \$42.39 a month. How much does he pay in 1 year?
6. Mrs. Reid bought a turkey which weighed 12.5 lb. How much did it cost at \$.64 a pound?
7. Potatoes are used in making starch. How many pounds of starch are made from 250 lb. of potatoes if .18 of the weight of potatoes is starch?
8. How thick will a pile of 125 sheets of paper be if each sheet of paper is .002 in. thick?
9. Mr. Green wanted to put a wire fence around a circular flower bed. If the greatest distance through the flower bed (diameter) was 9.5 ft., how many feet of wire would he need? (Hint: Multiply the diameter by 3.14).

DIAGNOSTIC TEST IN MULTIPLICATION OF DECIMALS

The work below will test you on the kinds of examples you should know in the multiplication of decimals. If you make mistakes in any kind go back and do again the exercises on the page whose number is shown at the right.

MULTIPLYING A DECIMAL BY A WHOLE NUMBER					Page	
1.	$\begin{array}{r} .2 \\ 3 \end{array}$	$\begin{array}{r} .7 \\ 5 \end{array}$	$\begin{array}{r} 6.8 \\ 4 \end{array}$	$\begin{array}{r} .14 \\ 7 \end{array}$	$\begin{array}{r} .95 \\ 9 \end{array}$	170
2.	$\begin{array}{r} 8.36 \\ 6 \end{array}$	$\begin{array}{r} .207 \\ 4 \end{array}$	$\begin{array}{r} .419 \\ 5 \end{array}$	$\begin{array}{r} 13.682 \\ 7 \end{array}$		
3.	$\begin{array}{r} 9.3 \\ 28 \end{array}$	$\begin{array}{r} 5.67 \\ 39 \end{array}$	$\begin{array}{r} 26.04 \\ 54 \end{array}$	$\begin{array}{r} 3.816 \\ 92 \end{array}$	$\begin{array}{r} .945 \\ 86 \end{array}$	
MULTIPLYING A WHOLE NUMBER BY A DECIMAL						171
4.	$\begin{array}{r} 3 \\ .3 \end{array}$	$\begin{array}{r} 8 \\ .6 \end{array}$	$\begin{array}{r} 49 \\ .5 \end{array}$	$\begin{array}{r} 67 \\ 4.7 \end{array}$	$\begin{array}{r} 56 \\ .18 \end{array}$	
5.	$\begin{array}{r} 347 \\ 21.9 \end{array}$	$\begin{array}{r} 583 \\ 1.75 \end{array}$	$\begin{array}{r} 892 \\ .384 \end{array}$	$\begin{array}{r} 721 \\ .526 \end{array}$	$\begin{array}{r} 482 \\ .409 \end{array}$	
MULTIPLYING DECIMALS BY 10, 100, AND 1000 Multiply each of these by 10, by 100, and by 1000						172
6.	4.37	6.1	15.283	.7	.59	
MULTIPLYING A DECIMAL BY A DECIMAL						177
7.	$\begin{array}{r} .7 \\ .5 \end{array}$	$\begin{array}{r} .63 \\ .4 \end{array}$	$\begin{array}{r} .258 \\ .6 \end{array}$	$\begin{array}{r} .617 \\ .8 \end{array}$	$\begin{array}{r} .94 \\ .72 \end{array}$	
8.	$\begin{array}{r} 3.7 \\ 2.8 \end{array}$	$\begin{array}{r} 4.56 \\ 7.63 \end{array}$	$\begin{array}{r} 8.65 \\ 4.18 \end{array}$	$\begin{array}{r} 9.27 \\ 59.2 \end{array}$	$\begin{array}{r} 15.04 \\ 6.03 \end{array}$	
9.	$\begin{array}{r} 39.7 \\ 13.7 \end{array}$	$\begin{array}{r} 7.63 \\ 5.3 \end{array}$	$\begin{array}{r} 4.18 \\ .7 \end{array}$	$\begin{array}{r} 59.2 \\ .48 \end{array}$	$\begin{array}{r} 6.23 \\ 3.6 \end{array}$	
WATCH ZEROS IN THE PRODUCT						178
10.	$\begin{array}{r} .4 \\ .2 \end{array}$	$\begin{array}{r} .03 \\ .3 \end{array}$	$\begin{array}{r} .16 \\ .4 \end{array}$	$\begin{array}{r} .02 \\ .03 \end{array}$	$\begin{array}{r} .12 \\ .7 \end{array}$	
11.	$\begin{array}{r} .81 \\ .06 \end{array}$	$\begin{array}{r} .001 \\ .8 \end{array}$	$\begin{array}{r} .012 \\ .6 \end{array}$	$\begin{array}{r} .086 \\ .4 \end{array}$	$\begin{array}{r} .075 \\ .9 \end{array}$	

LARGER MEASURES OF AREA

Area means the amount of surface. The units of area you already know are the square inch (sq. in.) and the square foot (sq. ft.)

Here is the rule for finding the area of a rectangle:

The number of square units in the area of a rectangle is found by multiplying the *number* of units in the length by the *number* of units in the width.

Before using the rule above, the length and width must be in the same unit of measure.

The Square Yard

To measure an area like that of the floor of the church hall or the gymnasium floor it is convenient to use a larger unit of area—the *square yard* (sq. yd.)

1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.
1 sq. ft.	1 sq. ft.	1 sq. ft.

A square yard is a square each of whose sides is 1 yard long.

Name areas that you would measure with the square yard.

Above you see a drawing to represent a square yard.

How many square feet are there in the first row? How many rows? Then how many square feet in 1 square yard?

Remember: **1 square yard (sq. yd.) = 9 square feet (sq. ft.)**

1. The floor of the gymnasium is 25 yd. long and 15 yd. wide. What is the area of the floor?
2. How many square feet are there in 20 sq. yd.?
3. How many square yards are there in 360 sq. ft.?
4. Mr. Dodd measured his lot last evening. It was 50 yd. long and 42 ft. wide. How many square yards are there in the lot?

LARGER MEASURES OF AREA

The Square Rod

The next larger measure of area than the square yard is the *square rod* (sq. rd.) The square rod is often used by farmers and surveyors in measuring land.

A square rod is a square each side of which is 1 rod long.

At recess mark off on the playground a square each side of which is 1 rod or $5\frac{1}{2}$ yards. This will give you a real idea of the amount of area in 1 square rod.

How many yards long is each side of a square rod? How would you find how many square yards there are in a square rod? How many are there?

Remember: **1 square rod(sq. rd.)=30 $\frac{1}{4}$ square yards(sq. yd.)**

The Acre

The next larger measure of area than the square rod is the *acre* (A.) Land is measured by the acre.

Remember: **1 acre (A.) = 160 square rods (sq. rd.)**

To get a real idea of the size of an acre you should mark out a square about 209 ft. on each side. The area of such a square will be 1 acre.

Find out how many acres there are in a field or a large plot of ground near your school.

The Square Mile

The largest measure of area is the *square mile* (sq. mi.) *A square mile is a square each side of which is 1 mile.* The square mile is used to measure very large areas like the area of a province or a country. Try to imagine a square which is 1 mile on each side. The area of the square will be 1 square mile.

Remember: **1 square mile (sq. mi.) = 640 acres (A.)**

A square mile of land is sometimes called a *section*. So a section of land contains 640 acres.

FINDING THE AREA OF A RECTANGLE

Below you see the complete table of measures of area. Memorize the table and do the problems.

144 square inches (sq. in.)	= 1 square foot (sq. ft.)
9 square feet (sq. ft.)	= 1 square yard (sq. yd.)
$30\frac{1}{4}$ square yards (sq. yd.)	= 1 square rod (sq. rd.)
160 square rods (sq. rd.)	= 1 acre (A.)
640 acres (A.)	= 1 square mile (sq. mi.)
	= 1 section

1. Bill broke Mrs. Ray's window with his baseball. He bought a pane of glass 16 in. long and 9 in. wide to repair it. How many square inches were there in the window pane? How many square feet?

2. Which is larger, a square 10 in. on each side, or a rectangle 1 ft. long and 9 in. wide? How much larger?

3. Mrs. Collins had her parlour floor sanded, waxed, and polished. If the floor was 18 ft. long and 14 ft. wide, how much did the job cost at \$.15 a square foot?

4. Mr. Gogan built a new house. How much did the tar paper for both sides of the roof cost at \$1.95 a roll if 1 roll covered 400 sq. ft. and each side was 40 ft. long and 20 ft. wide?

5. Ellen's father bought a piece of land 80 rd. long and 40 rd. wide. How many acres did he buy?

6. How many times larger is a square 6 in. on a side, than a square 3 in. on a side?

7. Farmer William bought $\frac{1}{4}$ section of land at \$15 an acre. How much did the land cost him?

8. How many square yards are there in a roll of wall paper which is 5 yd. long and 30 in. wide?

PRACTICE IN ADDITION AND SUBTRACTION OF FRACTIONS

Add and check.

Each answer must be in lowest terms.

$$1. \quad \begin{array}{r} \frac{3}{8} \\ \frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{4}{5} \\ \frac{1}{10} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{4} \\ \frac{1}{5} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{6} \\ \frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{11}{16} \\ \frac{3}{16} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{5} \\ \frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} \frac{1}{3} \\ \frac{2}{9} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{7} \\ \frac{7}{12} \\ \hline \end{array}$$

$$2. \quad \begin{array}{r} \frac{2}{5} \\ \frac{4}{5} \\ \hline \end{array} \quad \begin{array}{r} \frac{2}{3} \\ \frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{4} \\ \frac{5}{16} \\ \hline \end{array} \quad \begin{array}{r} \frac{9}{10} \\ \frac{7}{10} \\ \hline \end{array} \quad \begin{array}{r} \frac{5}{8} \\ \frac{7}{12} \\ \hline \end{array} \quad \begin{array}{r} \frac{11}{12} \\ \frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} \frac{5}{6} \\ \frac{3}{10} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{4} \\ \frac{7}{9} \\ \hline \end{array}$$

$$3. \quad \begin{array}{r} 4\frac{1}{12} \\ 2\frac{1}{12} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{1}{4} \\ 5\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{7}{16} \\ 8\frac{15}{16} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{3}{5} \\ 6\frac{9}{10} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{5}{8} \\ 4\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 5\frac{13}{16} \\ 8\frac{3}{4} \\ \hline \end{array}$$

$$4. \quad \begin{array}{r} 1\frac{5}{8} \\ 7\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{7}{10} \\ 5\frac{1}{2} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{3}{5} \\ 4\frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} 13\frac{11}{12} \\ 6\frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{4}{5} \\ 15\frac{9}{20} \\ \hline \end{array} \quad \begin{array}{r} 24\frac{5}{8} \\ 17\frac{9}{10} \\ \hline \end{array}$$

$$5. \quad \begin{array}{r} 3\frac{5}{16} \\ 1\frac{3}{16} \\ 4\frac{7}{16} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{3}{4} \\ 5\frac{1}{2} \\ 3\frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{1}{2} \\ 8\frac{2}{5} \\ 7\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{5}{6} \\ 6\frac{2}{3} \\ 8\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 2\frac{3}{5} \\ 8\frac{1}{6} \\ 4\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{4}{5} \\ 4\frac{3}{20} \\ 6\frac{3}{4} \\ \hline \end{array}$$

Subtract and check.

Each answer must be in lowest terms.

$$6. \quad \begin{array}{r} \frac{5}{7} \\ \frac{1}{7} \\ \hline \end{array} \quad \begin{array}{r} \frac{7}{12} \\ \frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} \frac{2}{3} \\ \frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} \frac{9}{16} \\ \frac{5}{16} \\ \hline \end{array} \quad \begin{array}{r} \frac{7}{10} \\ \frac{3}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{4} \\ \frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} \frac{3}{5} \\ \frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} \frac{11}{12} \\ \frac{9}{10} \\ \hline \end{array}$$

$$7. \quad \begin{array}{r} 4\frac{3}{5} \\ 3\frac{1}{5} \\ \hline \end{array} \quad \begin{array}{r} 8\frac{13}{16} \\ 5\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 4 \\ \frac{7}{10} \\ \hline \end{array} \quad \begin{array}{r} 6\frac{7}{8} \\ 1\frac{5}{12} \\ \hline \end{array} \quad \begin{array}{r} 9\frac{4}{5} \\ 4\frac{1}{3} \\ \hline \end{array} \quad \begin{array}{r} 12\frac{14}{15} \\ 7\frac{5}{6} \\ \hline \end{array}$$

$$8. \quad \begin{array}{r} 5\frac{3}{8} \\ 1\frac{5}{8} \\ \hline \end{array} \quad \begin{array}{r} 3\frac{2}{5} \\ 2\frac{9}{10} \\ \hline \end{array} \quad \begin{array}{r} 10\frac{1}{6} \\ 4\frac{7}{8} \\ \hline \end{array} \quad \begin{array}{r} 7\frac{2}{3} \\ 3\frac{4}{5} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{1}{4} \\ 2\frac{7}{10} \\ \hline \end{array} \quad \begin{array}{r} 14\frac{1}{2} \\ 6\frac{5}{8} \\ \hline \end{array}$$

$$9. \quad \begin{array}{r} 8\frac{3}{16} \\ 3\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 12\frac{1}{8} \\ 7\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 16\frac{1}{6} \\ 8\frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} 14\frac{5}{8} \\ 7\frac{9}{10} \\ \hline \end{array} \quad \begin{array}{r} 13\frac{8}{15} \\ 6\frac{5}{6} \\ \hline \end{array} \quad \begin{array}{r} 15\frac{3}{5} \\ 5\frac{11}{12} \\ \hline \end{array}$$

$$10. \quad \begin{array}{r} 17\frac{1}{6} \\ 8\frac{1}{4} \\ \hline \end{array} \quad \begin{array}{r} 11\frac{1}{2} \\ 6\frac{3}{5} \\ \hline \end{array} \quad \begin{array}{r} 18\frac{1}{12} \\ 9\frac{3}{4} \\ \hline \end{array} \quad \begin{array}{r} 21\frac{5}{8} \\ 14\frac{2}{3} \\ \hline \end{array} \quad \begin{array}{r} 35\frac{3}{10} \\ 28\frac{7}{12} \\ \hline \end{array} \quad \begin{array}{r} 46\frac{5}{16} \\ 19\frac{3}{8} \\ \hline \end{array}$$

KEEPING THE TOOLS SHARP

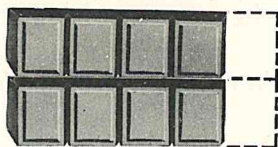
Multiply. Cancel when possible. Each answer must be in lowest terms.

- | | | | |
|--|------------------------------------|-------------------------------------|------------------------------------|
| 1. $6 \times \frac{3}{5}$ | $\frac{5}{6} \times 8$ | $2 \times \frac{7}{16}$ | $\frac{3}{4} \times 30$ |
| 2. $5 \times 7\frac{2}{3}$ | $9 \times 2\frac{3}{4}$ | $3 \times 5\frac{7}{10}$ | $\frac{1}{4} \times \frac{1}{3}$ |
| 3. $11 \times 3\frac{5}{6}$ | $\frac{7}{8} \times \frac{4}{5}$ | $\frac{2}{5} \times 1\frac{5}{6}$ | $7 \times 4\frac{4}{5}$ |
| 4. $\frac{9}{10} \times \frac{2}{3}$ | $1\frac{1}{2} \times 9\frac{3}{4}$ | $4\frac{1}{2} \times \frac{3}{4}$ | $\frac{5}{6} \times \frac{1}{4}$ |
| 5. $7\frac{3}{4} \times 4\frac{1}{2}$ | $5\frac{1}{3} \times 2\frac{3}{5}$ | $13 \times 4\frac{5}{12}$ | $\frac{9}{10} \times 3\frac{1}{2}$ |
| 6. $\frac{7}{10} \times \frac{5}{8}$ | $3\frac{7}{12} \times \frac{4}{5}$ | $4\frac{7}{10} \times 3\frac{2}{3}$ | $1\frac{3}{4} \times 3\frac{1}{3}$ |
| 7. $\frac{2}{3} \times 5\frac{1}{4}$ | $3\frac{3}{10} \times \frac{1}{2}$ | $1\frac{3}{4} \times 2\frac{5}{8}$ | $\frac{3}{4} \times \frac{4}{5}$ |
| 8. $4\frac{1}{16} \times 5\frac{3}{5}$ | $3\frac{3}{4} \times 1\frac{1}{3}$ | $\frac{5}{6} \times 3\frac{3}{5}$ | $7\frac{1}{5} \times \frac{5}{12}$ |
| 9. $1\frac{3}{5} \times 7\frac{1}{2}$ | $6\frac{5}{8} \times 1\frac{4}{5}$ | $4\frac{2}{5} \times \frac{5}{8}$ | $6\frac{5}{8} \times 3\frac{3}{5}$ |

Divide. Cancel when possible. Each answer must be in lowest terms.

- | | | | |
|--------------------------------------|-----------------------------------|-----------------------------------|-----------------------------------|
| 10. $8 \div \frac{1}{4}$ | $20 \div 3\frac{1}{3}$ | $\frac{2}{3} \div 6$ | $2 \div 3\frac{1}{8}$ |
| 11. $4\frac{9}{10} \div 7$ | $9 \div 7\frac{1}{2}$ | $\frac{1}{2} \div \frac{5}{8}$ | $\frac{3}{4} \div 5$ |
| 12. $7 \div \frac{2}{5}$ | $1\frac{1}{2} \div \frac{3}{10}$ | $3\frac{7}{16} \div \frac{5}{6}$ | $\frac{2}{3} \div \frac{4}{9}$ |
| 13. $\frac{3}{10} \div 4\frac{1}{2}$ | $\frac{11}{12} \div 4\frac{2}{5}$ | $9\frac{3}{4} \div 2\frac{7}{16}$ | $3\frac{2}{3} \div 4\frac{2}{5}$ |
| 14. $5\frac{3}{5} \div 4$ | $\frac{5}{6} \div 10$ | $\frac{8}{9} \div \frac{2}{3}$ | $\frac{1}{5} \div \frac{3}{4}$ |
| 15. $2\frac{1}{2} \div 6$ | $6\frac{3}{5} \div 1\frac{1}{4}$ | $3\frac{3}{16} \div 2\frac{5}{6}$ | $5\frac{3}{5} \div \frac{4}{5}$ |
| 16. $\frac{7}{8} \div \frac{2}{5}$ | $14\frac{2}{3} \div 1\frac{5}{6}$ | $5\frac{5}{12} \div \frac{5}{8}$ | $\frac{3}{4} \div 3\frac{1}{3}$ |
| 17. $6\frac{1}{4} \div 2\frac{1}{2}$ | $3\frac{3}{8} \div \frac{3}{5}$ | $6\frac{1}{3} \div 2\frac{1}{2}$ | $\frac{5}{16} \div 1\frac{1}{4}$ |
| 18. $\frac{3}{10} \div 4\frac{2}{7}$ | $1\frac{1}{2} \div 2\frac{1}{2}$ | $5\frac{5}{8} \div 3\frac{3}{4}$ | $3\frac{3}{10} \div 7\frac{1}{3}$ |

THE MEANING OF DIVIDING A DECIMAL BY A WHOLE NUMBER



Tony had a chocolate bar which was divided into 10 equal parts, but he ate 2-tenths of it. Tony divided the 8-tenths he had left into 2 equal parts and gave one piece to Fred. How many tenths of the bar did Fred get?

Using Fractions

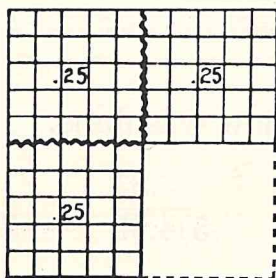
$$\frac{8}{10} \div 2 = \frac{8}{10} \times \frac{1}{2} = \frac{4}{10}$$

Using Decimals

$$\begin{array}{r} .4 \\ 2 \overline{) .8} \end{array}$$

So Fred got .4 of the chocolate bar.

Notice that the decimal point in the quotient is directly over the decimal point in the dividend.



A square was divided into 100 equal parts and 75 hundredths are shown on the left.

Now the 75 hundredths are divided into 3 equal parts. How many hundredths are there in each part?

Using Fractions

$$\frac{75}{100} \div 3 = \frac{75}{100} \times \frac{1}{3} = \frac{25}{100}$$

Using Decimals

$$\begin{array}{r} .25 \\ 3 \overline{) .75} \end{array}$$

So there are .25 in each part.

Notice that the decimal point in the quotient is directly over the decimal point in the dividend.

From the examples above you should be able to discover a rule for dividing a decimal by a whole number. Use the rule to do the exercises below.

- | | | | | |
|---------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| 1. $2 \overline{) .6}$ | 2. $3 \overline{) .9}$ | 3. $4 \overline{) .8}$ | 4. $3 \overline{) .6}$ | 5. $2 \overline{) .4}$ |
| 6. $4 \overline{) .84}$ | 7. $5 \overline{) .65}$ | 8. $6 \overline{) .96}$ | 9. $7 \overline{) .84}$ | 10. $3 \overline{) .72}$ |
| 11. $3 \overline{) .639}$ | 12. $2 \overline{) .314}$ | 13. $5 \overline{) .595}$ | 14. $6 \overline{) .744}$ | 15. $8 \overline{) .936}$ |

DIVIDING A DECIMAL BY A WHOLE NUMBER

Roy earns money by raising chickens. Yesterday he sold 3 chickens which weighed 15.75 lb. altogether. What was the average weight of the chickens?

To find the average weight of the chickens we *divide* 15.75 by 3.

Write the numbers as shown and divide.

Since the 3 chickens weighed about 15 lb., each chicken weighed about 5 lb. So a decimal point must go between the 5 and the 2 as shown.

$$\begin{array}{r} 5.25 \\ 3 \overline{)15.75} \end{array}$$

Notice that the decimal point in the quotient is directly over the decimal point in the dividend.

Rule: To divide a decimal by a whole number, first put a decimal point in the quotient directly over the decimal point in the dividend and divide.

Explain how each of the exercises below was done.

$$\begin{array}{l} 1. \quad \begin{array}{r} 3.4 \\ 2 \overline{)6.8} \end{array} \quad \begin{array}{r} 3.08 \\ 4 \overline{)12.32} \end{array} \quad \begin{array}{r} 24.87 \\ 3 \overline{)74.61} \end{array} \quad \begin{array}{r} .81 \\ 5 \overline{)4.05} \end{array} \quad \begin{array}{r} .3 \\ 7 \overline{)2.1} \end{array} \end{array}$$

Divide. Check each exercise.

$$\begin{array}{l} 2. \quad \begin{array}{r} 4 \overline{)16.8} \end{array} \quad \begin{array}{r} 2 \overline{)8.12} \end{array} \quad \begin{array}{r} 5 \overline{)35.45} \end{array} \quad \begin{array}{r} 6 \overline{)12.72} \end{array} \quad \begin{array}{r} 8 \overline{)96.8} \end{array} \\ 3. \quad \begin{array}{r} 3 \overline{)3.693} \end{array} \quad \begin{array}{r} 7 \overline{)15.4} \end{array} \quad \begin{array}{r} 6 \overline{)9.54} \end{array} \quad \begin{array}{r} 9 \overline{)10.8} \end{array} \quad \begin{array}{r} 4 \overline{)7.724} \end{array} \\ 4. \quad \begin{array}{r} 5 \overline{)4.15} \end{array} \quad \begin{array}{r} 2 \overline{)1.8} \end{array} \quad \begin{array}{r} 4 \overline{)3.416} \end{array} \quad \begin{array}{r} 7 \overline{)2.52} \end{array} \quad \begin{array}{r} 6 \overline{)4.8} \end{array} \\ 5. \quad \begin{array}{r} 21 \overline{)680.4} \end{array} \quad \begin{array}{r} 63 \overline{)15.75} \end{array} \quad \begin{array}{r} 45 \overline{)166.5} \end{array} \quad \begin{array}{r} 39 \overline{)8.97} \end{array} \quad \begin{array}{r} 13 \overline{)1.469} \end{array} \\ 6. \quad \begin{array}{r} 52 \overline{)239.2} \end{array} \quad \begin{array}{r} 71 \overline{)101.033} \end{array} \quad \begin{array}{r} 18 \overline{)11.52} \end{array} \quad \begin{array}{r} 27 \overline{)22.95} \end{array} \quad \begin{array}{r} 93 \overline{)167.4} \end{array} \end{array}$$

7. During the 31 days of July the total rainfall was 5.27 in. What was the average rainfall each day?

WRITING A FRACTIONAL REMAINDER AS A DECIMAL

$$\begin{array}{r} 5\frac{1}{4} \\ 4 \overline{)21} \\ \underline{20} \\ 1 \end{array}$$

Neil's father cut a board 21 ft. long into 4 equal pieces. How long was each piece?

To find how long each piece was we *divide* 21 by 4.

So each piece was $5\frac{1}{4}$ ft. long.

We know that $\frac{1}{4} = .25$, so we can say that each piece was 5.25 ft. long. Here we have written the remainder, which was a fraction, as a decimal. It is often better to write the remainder as a decimal. Below you will see how this is done.

$$\begin{array}{r} 5.25 \\ 4 \overline{)21.00} \\ \underline{20} \\ 10 \\ \underline{8} \\ 20 \\ \underline{20} \end{array}$$

Rule: Write a decimal point after the whole number in the dividend and divide, annexing zeros as needed to complete the division.

$$\begin{array}{r} 1.5 \\ 6 \overline{)9.0} \\ \underline{6} \\ 30 \\ \underline{30} \end{array}$$

Divide. Each remainder is to be written as a decimal.

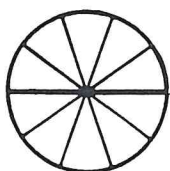
- | | | | | |
|------------------------|---------------------|---------------------|---------------------|----------------------|
| 1. $4 \overline{)6}$ | $8 \overline{)12}$ | $10 \overline{)22}$ | $15 \overline{)57}$ | $5 \overline{)38}$ |
| 2. $8 \overline{)26}$ | $12 \overline{)51}$ | $8 \overline{)30}$ | $16 \overline{)44}$ | $20 \overline{)125}$ |
| 3. $8 \overline{)25}$ | $8 \overline{)19}$ | $16 \overline{)74}$ | $32 \overline{)60}$ | $80 \overline{)430}$ |
| 4. $20 \overline{)48}$ | $12 \overline{)42}$ | $12 \overline{)99}$ | $16 \overline{)92}$ | $32 \overline{)80}$ |

5. During his vacation last summer, Tom worked 4 days helping Mr. Rogers make hay. If Tom got \$13 for his work, how much did he earn a day?

6. If 7 miles of pavement was laid on a road in 5 days what was the average number of miles of pavement laid each day?

7. Mr. Robbins used 14 tons of coal last year. If his furnace was used for 8 mo., how many tons of coal did he use each month on the average?

CHANGING A FRACTION TO A DECIMAL

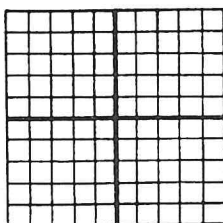


The circle is divided into 10 equal parts.

We see that $\frac{1}{2} = .5$. The fraction $\frac{1}{2}$ can be changed to the decimal .5 as shown below.

Write a decimal point after the numerator, 1, and divide by the denominator, 2. Annex zeros as needed to complete the division.

$$\begin{array}{r} .5 \\ 2 \overline{)1.0} \\ \underline{10} \end{array}$$



The square is divided into 100 equal parts.

We see that $\frac{3}{4} = .75$. The fraction $\frac{3}{4}$ can be changed to the decimal .75 as shown below.

$$\begin{array}{r} .75 \\ 4 \overline{)3.00} \\ \underline{28} \\ 20 \\ \underline{20} \end{array}$$

Write a decimal point after the numerator, 3, and divide by the denominator, 4. Annex zeros as needed to complete the division.

Rule: To change a fraction to a decimal write a decimal point after the numerator and divide by the denominator annexing zeros as needed to complete the division.

Change these fractions to decimals.

- | | | | | | | |
|----|----------------|---------------|----------------|----------------|----------------|-----------------|
| 1. | $\frac{1}{4}$ | $\frac{2}{5}$ | $\frac{3}{8}$ | $\frac{7}{20}$ | $\frac{4}{5}$ | $\frac{5}{8}$ |
| 2. | $\frac{7}{10}$ | $\frac{7}{8}$ | $\frac{9}{20}$ | $\frac{3}{5}$ | $\frac{7}{40}$ | $\frac{11}{20}$ |

Change $\frac{1}{3}$ to a decimal.

Some fractions when changed to decimals do not come out evenly no matter how far the division is carried. In these cases it is best to use two decimal places and write the remainder as a fraction.

So $\frac{1}{3} = .33\frac{1}{3}$

$$\begin{array}{r} .333 + = .33\frac{1}{3} \\ 3 \overline{)1.000} \\ \underline{9} \\ 10 \\ \underline{9} \\ 10 \\ \underline{9} \\ 1 \end{array}$$

3. Change these fractions to decimals: $\frac{2}{3}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{2}{15}$
You should know these by heart. Memorize them.

$$\frac{1}{2} = .5$$

$$\frac{1}{3} = .33\frac{1}{3}$$

$$\frac{2}{5} = .4$$

$$\frac{1}{6} = .16\frac{2}{3}$$

$$\frac{1}{4} = .25$$

$$\frac{2}{3} = .66\frac{2}{3}$$

$$\frac{3}{5} = .6$$

$$\frac{1}{8} = .125$$

$$\frac{3}{4} = .75$$

$$\frac{1}{5} = .2$$

$$\frac{4}{5} = .8$$

$$\frac{3}{8} = .375$$

PRACTICE IN ADDING AND SUBTRACTING DECIMALS

Add. Check each exercise.

1.	5.2	2.35	4.517	53.64	4.235
	6.4	65.63	3.407	.52	.308
	4.6	53.07	8.044	7.45	37.046
	5.7	8.44	6.690	.83	85.860
	<u>4.3</u>	<u>1.36</u>	<u>5.765</u>	<u>42.92</u>	<u>.072</u>

2.	.3	.03	.06	.024	.003	.174
	.5	.01	.08	.016	.006	.047
	.8	.04	.05	.023	.007	.862
	<u>.5</u>	<u>.02</u>	<u>.07</u>	<u>.031</u>	<u>.009</u>	<u>.575</u>

3. $6.13 + .77 + 3.54 + .73 + 7.32$

4. $3.745 + .922 + 45.463 + 12.056 + .347$

5. $.065 + .018 + .042 + .006 + .044$

Subtract. Check each exercise.

6.	5.6	8.2	46.4	74.11	408.46
	<u>2.3</u>	<u>3.7</u>	<u>28.5</u>	<u>27.46</u>	<u>374.58</u>

7.	63.4	7.75	9.744	82.641	245.285
	<u>55.9</u>	<u>6.83</u>	<u>5.483</u>	<u>27.785</u>	<u>147.459</u>

8.	.8	.9	.84	.72	.06	.08
	<u>.3</u>	<u>.4</u>	<u>.22</u>	<u>.58</u>	<u>.01</u>	<u>.05</u>

9.	.13	.17	.065	.082	.149
	<u>.06</u>	<u>.09</u>	<u>.034</u>	<u>.039</u>	<u>.056</u>

10.	.941	.005	.002	.236	.528
	<u>.498</u>	<u>.002</u>	<u>.001</u>	<u>.167</u>	<u>.449</u>

11. $.71 - .49$ 12. $5.5 - 1.6$ 13. $9.06 - 3.09$

14. $.12 - .03$ 15. $6 - 2.372$ 16. $1 - .026$

GETTING READY FOR DIVIDING A DECIMAL BY A DECIMAL

I. Review the rules you learned on page 172 for multiplying a decimal by 10, 100, and 1000.

2.7 multiplied by 10 is 27; by 100 is 270; by 1000 is 2700

1.36 multiplied by 10 is 13.6; by 100 is 136; by 1000 is 1360

16.4 multiplied by 10 is 164; by 100 is 1640; by 1000 is 16400

Multiply each decimal below by 10, 100, and 1000

(a) 5.3 12.8 6.19 20.35 4.637

II. In the division example $3\overline{)6}$, the divisor is 3, the dividend is 6, and the quotient is 2.

If we multiply both the divisor, 3, and the dividend, 6, by 10 we get $30\overline{)60}$. The quotient, 2, does not change.

If we multiply both the divisor, 3, and the dividend, 6, by 100 we get $300\overline{)600}$. The quotient, 2, does not change.

If we multiply the divisor, 3, and the dividend, 6, both by 1000 we get $3000\overline{)6000}$. The quotient, 2, does not change.

In each of the above we multiplied both the divisor and the dividend by the same number. Hence the rule:

If both the divisor and the dividend are multiplied by the same number the quotient is not changed.

III. We know that $4\overline{)3.2}$ and $6\overline{).72}$

When the divisor is a whole number the decimal point in the quotient is directly over the decimal point in the dividend.

If you remember the three steps above you will find it easy to divide a decimal by a decimal.

DIVIDING A DECIMAL BY A DECIMAL

On an automobile trip Roy's father drove 126.75 mi. If he used 6.5 gal. of gasoline, how many miles did he average to the gallon?

To find how many miles he averaged to the gallon we *divide* 126.75 by 6.5.

$$\begin{array}{r}
 19.5 \\
 6.5 \overline{)126.7\overset{\wedge}{5}} \\
 \underline{65} \\
 617 \\
 \underline{585} \\
 325 \\
 \underline{325} \\
 0
 \end{array}$$

It will be easier to divide if we think of the divisor as a whole number.

We can do this if we multiply the divisor by 10. Put a $\wedge$ (**caret**) after the 5 to show where the decimal point would be.

If the quotient is not to be changed we must multiply the dividend by 10. Put a caret after the 7 to show where the decimal point would be.

Now that we can think of the divisor as a whole number, the decimal point in the quotient will be directly **above the caret** in the dividend. *Put the decimal point in the quotient before you divide.*

Now divide as you would with whole numbers, making sure that the figures in the quotient are put in their proper places. So Roy's father averaged 19.5 mi. to the gallon.

By using carets ($\wedge$) show where the decimal point in the quotient must go in each of the exercises below. Do not divide.

1. $4.3 \overline{)26.17}$ $5.1 \overline{)15.8}$ $1.49 \overline{)3.562}$ $.31 \overline{).7542}$

Divide. Check each exercise.

2. $3.2 \overline{)23.68}$ $1.23 \overline{)4.551}$ $.45 \overline{)2.835}$ $2.6 \overline{)3.432}$

3. $4.6 \overline{)59.8}$ $12.7 \overline{)304.8}$ $3.42 \overline{)116.28}$ $.513 \overline{)9.234}$

4. $5.2 \overline{)1.872}$ $6.47 \overline{)5.176}$ $.73 \overline{).2555}$ $4.74 \overline{)2.844}$

5. $1.48 \overline{)4.736}$ $.36 \overline{).1872}$ $4.7 \overline{)29.61}$ $.603 \overline{).9045}$

6. $7.3 \overline{)18.98}$ $2.45 \overline{)100.45}$ $3.29 \overline{)11.844}$

DIVIDING A DECIMAL BY A DECIMAL

Farmer Ryan shipped 45.5 lb. of milk to the creamery yesterday. If a quart of milk weighs 2.58 lb., how many quarts of milk did he ship?

To find how many quarts he shipped we *divide* 45.5 by 2.58.

Multiply the divisor by 100. Put a caret after the 8 to show where the decimal point would be.

Multiply the dividend by 100. You will have to annex a zero after the 5 before you put in a caret to show where the decimal point would be.

Put a decimal point in the quotient directly above the caret in the dividend.

Now divide as if you were dividing whole numbers.

Since the quotient does not come out evenly annex zeros in the dividend for as many decimal places as you need in the quotient.

A + sign is used to show that the division is not exact.

The best answer to this problem is 17.6.

So Farmer Ryan shipped 17.6 qt. of milk.

$$\begin{array}{r}
 17.63+ \\
 2.58 \overline{)45.50} \\
 \underline{25\ 8} \\
 19\ 70 \\
 \underline{18\ 06} \\
 1\ 640 \\
 \underline{1\ 548} \\
 920 \\
 \underline{774} \\
 146
 \end{array}$$

Divide. Check each answer.

1. $.72 \overline{)28.8}$ $.45 \overline{)3.6}$ $1.62 \overline{)8.1}$ $.325 \overline{)19.5}$
2. $1.225 \overline{)9.8}$ $.535 \overline{)13.91}$ $2.53 \overline{)379.5}$ $.026 \overline{)7.8}$
3. $.059 \overline{)2.36}$ $.004 \overline{)1.2}$ $.003 \overline{)2.7}$ $.007 \overline{).56}$

Divide. If the division is not exact carry the quotient to two decimal places.

4. $3.72 \overline{)6.9}$ $5.14 \overline{)30.8}$ $.73 \overline{)9.2}$ $.145 \overline{)7.5}$
5. $.029 \overline{)14.8}$ $.061 \overline{)25.7}$ $8.16 \overline{)39.2}$ $9.37 \overline{)72.6}$
6. $.63 \overline{)44.1}$ $4.37 \overline{)26.5}$ $.725 \overline{)434.4}$ $.08 \overline{)3.1}$
7. $8.04 \overline{)93.2}$ $.009 \overline{).54}$ $.027 \overline{)16.3}$ $5.61 \overline{)9.2}$

ROUNDING DECIMALS

When working with decimals our answers are often more sensible if they are expressed to the *nearest tenth*, the *nearest hundredth*, or the *nearest thousandth*. It is more sensible to say that the distance between two towns is 6.3 mi., than to say it is 6.32 mi. It is usually not practical to measure to hundredths of a mile.

When we express a decimal to the nearest tenth, hundredth, or thousandth, we say we *round* the decimal.

In the example on the right the quotient is carried to the four decimal places.

To the nearest tenth, .2571 is .3

To the nearest hundredth, .2571 is .26

To the nearest thousandth, .2571 is .257

In the same way 6.463 to the nearest hundredth is 6.46

$$\begin{array}{r} .2571 \\ .7 \overline{)1.8000} \end{array}$$

To round a decimal to the nearest tenth, look at the figure in the hundredths' place. If the figure in the hundredths' place is 5 or more increase the tenths' figure by 1 and drop all figures to the right of the tenths' place. If the figure in the hundredths' place is less than 5, drop all figures to the right of the tenths' place.

To round decimals to the nearest hundredth or thousandth follow the same plan as in rounding to the nearest tenth.

1. Round to the nearest tenth: .36; .42; .75; 2.64; 1.96
2. Round to the nearest hundredth: .523; .615; 3.466
3. Round to the nearest thousandth: .1467; .0982; 8.3607

To round a decimal quotient when dividing, carry the division to *one more decimal place than is needed* and round the decimal.

Divide and round the quotients to the nearest hundredth:

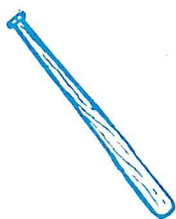
4. $3 \overline{) .547}$

$.4 \overline{) .955}$

$1.3 \overline{) 6.87}$

$6.03 \overline{) 45.2}$

BASEBALL AVERAGES



Frank was the best batter on the school baseball team. In the games with the Scouts, Frank was at bat 23 times and he made 9 hits. What was Frank's batting average? To find his batting average we *divide* the number of hits he made by the number of times he was at bat.

We find $9 \div 23$ which is the same as $\frac{9}{23}$.

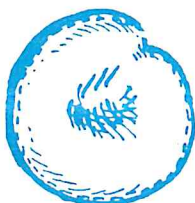
$$\begin{array}{r} .3913 \\ 23 \overline{)9.000} \\ \underline{69} \\ 210 \\ \underline{207} \\ 30 \end{array}$$

Change the fraction $\frac{9}{23}$ to a decimal fraction.

Carry the quotient to four decimal places and round it to the nearest thousandth.

So Frank's batting average was .391

In baseball language
69 Frank batted "three
1 ninety-one".



In baseball, batting averages, fielding averages, and per cent of games won, are written as decimal fractions carried to thousandths.

1. Jack Graham was the best batter on the Scouts' team. He made 8 hits out of 22 times at bat. What was Jack's batting average?

2. Tony is a pretty good hitter. He got 6 hits out of 21 times at bat. What was Tony's batting average?

3. Leo is a good fielder. He had 23 catches to make and he caught 22 of them. What was his fielding average?

4. Jackie Robinson, of the Brooklyn Dodgers was the best batter in the National League in 1949. He made 203 hits out of 593 times at bat. What was his batting average?

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	9559	6586	7544	\$46.97	\$ 3.91
	4807	3602	6602	8.56	11.36
	4166	8098	8748	48.25	70.67
	7788	3140	2902	6.82	7.82
	5515	8023	9257	7.50	79.20
	<u>8307</u>	<u>7392</u>	<u>6303</u>	<u>95.41</u>	<u>9.01</u>

Subtract. Check each exercise.

2.	69336	86529	45328	68262	40080
	<u>55602</u>	<u>38534</u>	<u>17859</u>	<u>47773</u>	<u>28684</u>
3.	71160	57141	84013	93700	70246
	<u>69491</u>	<u>48286</u>	<u>33245</u>	<u>34035</u>	<u>35839</u>
4.	82364	84135	14657	54500	31101
	<u>29788</u>	<u>35766</u>	<u>12839</u>	<u>47006</u>	<u>18367</u>

Multiply. Check each exercise.

5.	1957	8104	4297	7019	6859
	<u>6</u>	<u>7</u>	<u>9</u>	<u>8</u>	<u>5</u>
6.	54	64	463	1309	2058
	<u>30</u>	<u>42</u>	<u>58</u>	<u>69</u>	<u>48</u>
7.	721	608	925	862	463
	<u>153</u>	<u>426</u>	<u>700</u>	<u>590</u>	<u>308</u>
					<u>942</u>
					<u>604</u>

Divide. Check each exercise.

8.	83) <u>52041</u>	64) <u>15563</u>	78) <u>35348</u>	49) <u>16094</u>
9.	34) <u>19295</u>	15) <u>10435</u>	57) <u>24510</u>	93) <u>55986</u>
10.	172) <u>92536</u>	524) <u>173845</u>	782) <u>325761</u>	

KEEPING THE TOOLS SHARP

Multiply. Cancel when possible. Each answer must be in lowest terms.

1. $5 \times \frac{3}{4}$

$\frac{3}{5} \times 9$

$\frac{7}{8} \times 36$

$2 \times \frac{3}{10}$

2. $4 \times 2\frac{2}{5}$

$7 \times 6\frac{1}{2}$

$3 \times 7\frac{5}{16}$

$\frac{1}{4} \times \frac{1}{2}$

3. $\frac{2}{3} \times \frac{4}{5}$

$8 \times 3\frac{2}{3}$

$\frac{1}{2} \times 3\frac{1}{2}$

$\frac{5}{6} \times 3\frac{3}{5}$

4. $8\frac{1}{8} \times \frac{7}{10}$

$7\frac{1}{2} \times 2\frac{1}{4}$

$11 \times 4\frac{5}{6}$

$\frac{9}{16} \times \frac{2}{5}$

5. $6\frac{1}{3} \times 3\frac{1}{5}$

$\frac{3}{5} \times \frac{5}{6}$

$7\frac{4}{5} \times 6\frac{1}{2}$

$9 \times 5\frac{1}{4}$

6. $\frac{2}{5} \times \frac{3}{4}$

$\frac{7}{12} \times 7\frac{1}{5}$

$4\frac{5}{6} \times 3\frac{3}{4}$

$3\frac{7}{16} \times 1\frac{3}{5}$

7. $3\frac{1}{3} \times \frac{2}{5}$

$6\frac{3}{8} \times 6\frac{2}{3}$

$\frac{5}{12} \times \frac{3}{10}$

$\frac{3}{4} \times 2\frac{3}{8}$

8. $\frac{3}{10} \times 8\frac{3}{4}$

$2\frac{4}{5} \times \frac{1}{6}$

$2\frac{1}{4} \times 9\frac{1}{3}$

$5\frac{1}{3} \times \frac{3}{4}$

9. $9\frac{1}{6} \times 8\frac{2}{5}$

$6\frac{3}{4} \times \frac{2}{3}$

$2\frac{7}{10} \times 3\frac{3}{4}$

$4\frac{7}{12} \times 2\frac{1}{10}$

Divide. Cancel when possible. Each answer must be in lowest terms.

10. $5 \div \frac{2}{3}$

$10 \div 2\frac{1}{2}$

$\frac{1}{6} \div 5$

$1 \div 1\frac{1}{4}$

11. $3\frac{1}{2} \div 2$

$6 \div 4\frac{2}{3}$

$\frac{3}{4} \div \frac{3}{16}$

$\frac{3}{8} \div 6$

12. $10 \div \frac{4}{5}$

$3\frac{1}{8} \div \frac{5}{8}$

$5\frac{3}{5} \div 12$

$\frac{5}{12} \div \frac{1}{6}$

13. $\frac{2}{5} \div 1\frac{1}{2}$

$\frac{9}{16} \div 3\frac{3}{8}$

$14\frac{2}{3} \div 1\frac{5}{6}$

$3\frac{1}{2} \div 2\frac{4}{5}$

14. $5\frac{1}{3} \div 4$

$\frac{7}{10} \div 14$

$\frac{3}{8} \div \frac{9}{10}$

$\frac{5}{6} \div \frac{2}{5}$

15. $2\frac{3}{5} \div 3$

$5\frac{1}{2} \div 1\frac{1}{3}$

$2\frac{1}{4} \div 5\frac{5}{8}$

$1\frac{1}{4} \div \frac{5}{16}$

16. $\frac{1}{3} \div \frac{1}{2}$

$6\frac{3}{8} \div \frac{3}{4}$

$9\frac{1}{5} \div 2\frac{3}{10}$

$\frac{2}{3} \div 2\frac{1}{2}$

17. $9\frac{3}{5} \div \frac{8}{9}$

$7\frac{1}{12} \div 3\frac{3}{4}$

$\frac{7}{8} \div 1\frac{3}{4}$

$3\frac{3}{10} \div 3\frac{2}{3}$

18. $\frac{5}{6} \div 2\frac{1}{4}$

$3\frac{7}{16} \div 5\frac{1}{2}$

$2\frac{1}{12} \div 4\frac{1}{6}$

$4\frac{2}{3} \div 1\frac{1}{4}$

THE MEANING OF DIVIDING A WHOLE NUMBER BY A DECIMAL

When Mary practises on the piano she does so, on the average, for 8-tenths of an hour. Last month Mary practised 16 hours altogether. On how many days did she practise last month?

To find how many days she practised, we *divide* 16 by 8-tenths.

By using fractions we can find how many days she practised this way: $16 \div \frac{8}{10} = \cancel{16}^2 \times \frac{10}{\cancel{8}_1} = 20$

So Mary practised on 20 days last month.

The answer will be the same if we use decimals by

dividing 16 by .8. So $\begin{array}{r} 20 \\ .8 \overline{)16} \end{array}$

We can get the answer, 20, by dividing the whole number 16, by the decimal .8 by the rules we have already learned for dividing decimals.

20. Multiply the divisor by 10. Put a caret after the 8 to show where the decimal point would be.
 $.8 \overline{)16.0}$ Before you multiply the dividend by 10 put a decimal point after the whole number.
 Multiply the dividend by 10 by annexing a zero and put a caret after it to show where the decimal point would be.
 Put a decimal point in the quotient above the caret in the dividend. Now divide as if you were dividing whole numbers.

So Mary practised on 20 days last month.

Divide. Check each answer.

- | | | | | |
|-------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. $.2 \overline{)4}$ | 3. $.9 \overline{)9}$ | 4. $.4 \overline{)16}$ | 5. $.5 \overline{)35}$ | 6. $.6 \overline{)48}$ |
| 2. $.8 \overline{)40}$ | 4. $.9 \overline{)96}$ | 6. $.6 \overline{)132}$ | 7. $.7 \overline{)315}$ | 9. $.9 \overline{)306}$ |
| 3. $.24 \overline{)48}$ | 13. $.39 \overline{)39}$ | 32. $.96 \overline{)96}$ | 04. $.24 \overline{)24}$ | 07. $.49 \overline{)49}$ |
| 4. $.09 \overline{)36}$ | 25. $.50 \overline{)50}$ | 05. $.3 \overline{)3}$ | 02. $.6 \overline{)6}$ | 08. $.4 \overline{)4}$ |

DIVIDING A WHOLE NUMBER BY A DECIMAL

Harry and David started on a bicycle trip. During the first 3.5 hr. they travelled 26 mi. How many miles an hour did they average?

To find how many miles an hour they averaged, we divide 26 by 3.5.

Put a decimal point after the 26.

Multiply the divisor by 10. Do not move the decimal point but put a ^ (caret) after the 5 to show where the decimal point would be. Multiply the dividend by 10. Do not move the decimal point but annex a zero

and put a caret after the zero to show where the decimal point would be.

Put a decimal point in the quotient directly above the caret in the dividend.

Now divide as if you were dividing whole numbers, annexing zeros in the dividend so that (in this case) there are two decimal places in the quotient. The quotient is 7.42.

Our answer here will be more reasonable if we round it to the nearest tenth because from the problem it is unlikely that the distance Harry and David travelled was measured very accurately. 7.42 to the nearest tenth is 7.4.

So Harry and David averaged 7.4 mi. an hour.

$$\begin{array}{r} 7.42 \\ 3.5 \overline{) 26.0 \wedge 00} \\ \underline{245} \\ 150 \\ \underline{140} \\ 100 \\ \underline{70} \\ 30 \end{array}$$

In dividing decimals, whether you find the answer to the nearest tenth, hundredth, or thousandth it depends on how accurate the measures used are. The more accurate the measures the more decimal places. The answer must always be reasonable.

Divide. Check each answer.

$$\begin{array}{llll} 1. & 2.5 \overline{) 17} & 7.5 \overline{) 24} & 1.25 \overline{) 7} \end{array} \quad 1.5 \overline{) 9}$$

Divide. and round each quotient to the nearest tenth:

$$2. \quad 4.3 \overline{) 21} \quad 8.1 \overline{) 7} \quad 3.15 \overline{) 13} \quad 6.53 \overline{) 11}$$

Divide. and round each quotient to the nearest hundredth:

$$3. \quad 5.2 \overline{) 43} \quad 24.3 \overline{) 23} \quad 8.54 \overline{) 95} \quad 9.05 \overline{) 8}$$

YOU MAY NEED ZEROS IN THE QUOTIENT

On Saturdays Ted works in a meat market. He likes to use the machine that slices ham. If he slices .25 in. of ham into 5 equal slices, how thick is each slice of ham?

$$\begin{array}{r} .05 \\ 5 \overline{) .25} \\ \underline{25} \end{array}$$

To find how thick each slice is we *divide* .25 by 5. Put a decimal point in the quotient directly over the decimal point in the dividend. Think, "5's in 25 are 5".

Put the 5 in the quotient over the 5 in the dividend.

There is an *empty place* in the quotient between the 5 and the decimal point. Put a zero in the quotient to fill the empty space. The zero will be over the 2 of the dividend. So each slice of ham is .05 in. thick.

Tell how
each of these
is done



$$\begin{array}{r} .041 \\ 6 \overline{) .246} \end{array}$$

$$\begin{array}{r} .07 \\ 2.3 \overline{) 1.61} \end{array}$$

$$\begin{array}{r} .005 \\ 5 \overline{) .025} \end{array}$$

$$\begin{array}{r} .004 \\ 38 \overline{) .152} \end{array}$$

Divide. Watch the zeros in the quotient. Prove each exercise.

1. $4 \overline{) .24}$

$7 \overline{) .56}$

$6 \overline{) .426}$

$5 \overline{) .125}$

2. $8 \overline{) .048}$

$9 \overline{) .063}$

$4 \overline{) .008}$

$6 \overline{) .0054}$

3. $2.4 \overline{) .144}$

$3.5 \overline{) .175}$

$5.2 \overline{) .312}$

$4.1 \overline{) .287}$

4. $42 \overline{) 3.78}$

$6.3 \overline{) .252}$

$54 \overline{) .324}$

$26 \overline{) .052}$

5. $5 \overline{) .015}$

$.06 \overline{) .0048}$

$25 \overline{) .05}$

$35 \overline{) .14}$

6. If 9 lb. of sugar cost \$.54, how much did each pound cost?

7. A box of 36 Christmas cards cost \$2.52. How much did each card cost?

DIVIDING BY 10, 100, AND 1000

Do the complete division for each of the examples below and you will find that the quotients are correct.

The decimal is divided by 10.

$$234.7 \div 10 = 23.\underline{4}7$$

What happens to the decimal point?

$$\begin{array}{r} 23.47 \\ 10 \overline{)234.7} \end{array}$$

The decimal is divided by 100.

$$234.7 \div 100 = 2.\underline{3}47$$

What happens to the decimal point?

$$\begin{array}{r} 2.347 \\ 100 \overline{)234.7} \end{array}$$

The decimal is divided by 1000.

$$234.7 \div 1000 = .\underline{2}347$$

What happens to the decimal point?

$$\begin{array}{r} .2347 \\ 1000 \overline{)234.7} \end{array}$$

In the whole number the decimal point is understood to be at the right of the figure in the one's place. $126 = 126.$

Tell how
these
are done.



$$126. \div 10 = 12.\underline{6}$$

$$126 \div 100 = 1.\underline{2}6$$

$$126. \div 1000 = .126$$

To divide a number by 10, move the decimal point one place to the left; to divide a number by 100, move the decimal point two places to the left; to divide a number by 1000, move the decimal point three places to the left.

Divide each of the numbers below by 10.

1. 35.4 7.5 4.29 1.723 8

Divide each of the numbers below by 100.

2. 467.1 28.3 12.5 627 1395

Divide each of the numbers below by 1000.

3. 296.9 1738.42 803 2670

4. Margaret's father was paid \$47.50 for 10 days work. How much did he earn each day?

5. The total weight of a shipment of 100 hogs was 16850 lb. What was the average weight of the hogs?

ESTIMATING THE ANSWER

In dividing decimals we may sometimes get an answer that is *unreasonable*. We must be sure that the decimal point in the quotient is in the right place. Very often **we can avoid unreasonable answers by estimating the answer before we do the division.** By comparing the answer we get in division with the estimated answer we can tell if our answer is reasonable. Study the examples below.

1. Divide 66.78 by 4.2

Think, "4.2 is about the same as 4; and 66.78 is about the same as 66. Since 4's in 66 are about 16, the answer, when the division is done, should be about 16.

The work on the right gives the answer 15.9, which is about 16, so the answer 15.9 is *reasonable*. To make sure it is correct, check the work.

$$\begin{array}{r} 15.9 \\ 4.2 \overline{)66.78} \\ \underline{42} \\ 247 \\ \underline{210} \\ 378 \\ \underline{378} \\ 0 \end{array}$$

2. Divide 34 by 6.8

Think, "6.8 is about the same as 7; and 7's in 34 are about 5. When the division is done the answer should be about 5.

The work on the right gives the answer 5, the same as our estimated answer. So 5 is a *reasonable* answer. To make sure it is correct, check the work.

$$\begin{array}{r} 5. \\ 6.8 \overline{)34.0} \\ \underline{34} \\ 0 \end{array}$$

3. Divide 9 by .45

Think, ".45 is about $\frac{1}{2}$ and $9 \div \frac{1}{2} = 18$. So the answer should be about 18.

The work on the right gives the answer 20 which is about 18. So 20 is a *reasonable* answer. To make sure it is correct, check the work.

$$\begin{array}{r} 20. \\ .45 \overline{)9.00} \\ \underline{90} \\ 0 \end{array}$$

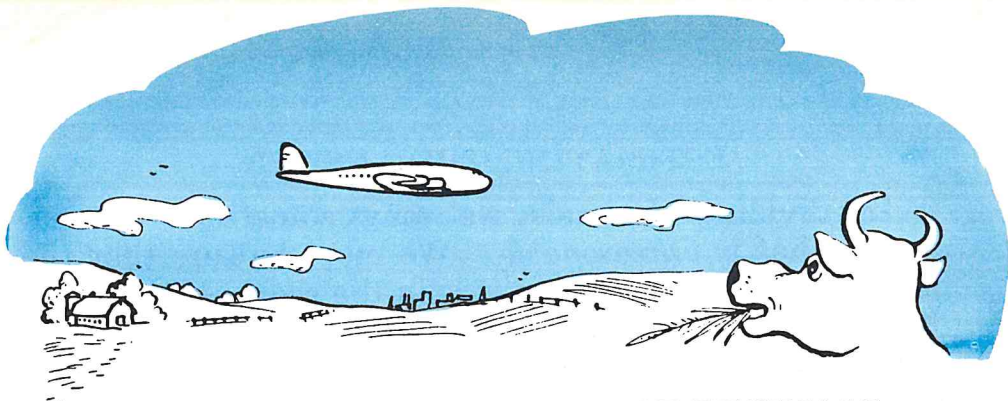
Divide. Estimate the answer before you do the work. Be sure the answer is reasonable.

1. $8.23 \overline{)33.743}$

$5.2 \overline{)26}$

$1.75 \overline{)14}$

$.26 \overline{)1.3}$



PROBLEMS USING DIVISION OF DECIMALS

1. A Trans-Canada air-liner flew 1012.5 mi. in 4.5 hr. What was its average speed per hour?

2. If 6.25 gal. of water weigh 62.5 lb., how many pounds does a gallon of water weigh?

3. George runs his own soft drinks canteen in the summer. If he pays \$.96 for a case of 24 bottles, how much does each bottle cost him?

4. If a loaf of bread, 10.5 in. long, is cut into slices which are .5 in. thick, how many slices will there be?

5. The Jones Paving Company had the job of paving 12 mi. of highway. How many days will it take to do the job if .8 mi. are paved each day?

6. Miss Ellis, the art teacher, bought 48 drawing pencils for her class. If she paid \$3.84 for them, how much did each drawing pencil cost?

7. The principal of the school bought a package of scribbling paper. If the package was 1.5 in. thick and each sheet of paper is .002 in. thick, how many sheets of paper were there in the package?

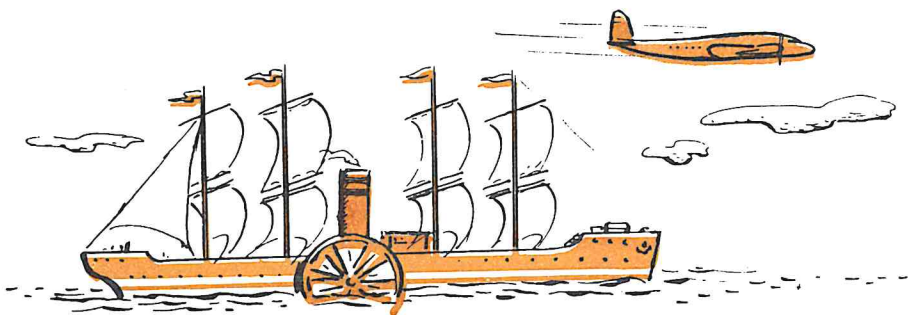
8. "Ginger" Edwards got 11 hits out of 32 times at bat, what was "Ginger's" batting average?

9. In some countries, long distances are measured by the kilometer. If a kilometer is .625 mi., how many kilometers are there in 25 mi.?

DIAGNOSTIC TEST IN DIVISION OF DECIMALS

The work below will test you on the kinds of examples you should know in the division of decimals. If you make mistakes on any kind go back and do again the exercises on the page whose number is shown at the right.

DIVIDING A DECIMAL BY A WHOLE NUMBER				Page
1. $2\overline{)8}$	$7\overline{)91}$	$6\overline{)84}$	$4\overline{)612}$	187
2. $5\overline{)21.85}$	$8\overline{)5.12}$	$23\overline{)62.1}$	$37\overline{)15.54}$	188
WRITING A REMAINDER AS A DECIMAL				
3. $5\overline{)17}$	$12\overline{)49}$	$24\overline{)66}$	$8\overline{)27}$	189
CHANGING A FRACTION TO A DECIMAL				
4. $\frac{3}{4}$	$\frac{3}{5}$	$\frac{7}{8}$	$\frac{5}{9}$ $\frac{3}{7}$	190
DIVIDING A DECIMAL BY A DECIMAL				
5. $4.3\overline{)11.18}$	$15.6\overline{)655.2}$	$7.28\overline{)40.768}$	$8.4\overline{)2.436}$	193 } 194 }
6. $.64\overline{)19.2}$	$2.35\overline{)9.4}$	$1.475\overline{)11.8}$	$.008\overline{).32}$	
ROUNDING DECIMALS				
Round to the nearest tenth, hundredth, and thousandth.				
7. .2354	.4617	.6275	.5026	195
DIVIDING A WHOLE NUMBER BY A DECIMAL				
8. $.3\overline{)6}$	$.4\overline{)156}$	$.26\overline{)78}$	$.08\overline{)4}$	199
9. $4.6\overline{)23}$	$3.25\overline{)26}$	$9.4\overline{)22}$	$6.04\overline{)5}$	200
YOU MAY NEED ZEROS IN THE QUOTIENT				
10. $3\overline{).27}$	$7\overline{).042}$	$6.4\overline{).448}$	$45\overline{).36}$	201



CONQUERING THE NORTH ATLANTIC

+ The questions below state true facts. They will help you to understand how the time required to cross the North Atlantic has been lessened over a period of years.

1. In 1838, a sailing vessel, the *Great Western*, crossed the Atlantic from England to New York at the rate of 8.5 mi. an hour. One hundred years later, in 1938, the *Queen Mary* travelled from England to New York at the rate of 30.9 mi. per hr. How many more miles did the *Queen Mary* travel an hour than the *Great Western*?

2. In 1919, two British airmen, Alcock and Brown flew their plane from Newfoundland to Ireland, a distance of 1960 mi. in 16.2 hr. What was their average speed an hour to the nearest tenth?

3. In 1927, Lindbergh flew from New York to Paris, a distance of 3600 mi. in 33.5 hr. What was his average speed an hour to the nearest tenth?

4. In 1934, a French pilot flew from Paris to New York in 38.4 hr. If he flew 4000 mi., what was his average speed an hour to the nearest tenth?

5. In 1948, a Constellation airliner, with 43 passengers on board, flew from New York to London, a distance of 3537 mi. in 10.6 hr. What was the average speed an hour to the nearest tenth?

CHANGING MEASURES

CHANGING LARGER MEASURES TO SMALLER MEASURES

(a) **Change 15 yd. to feet.**

There are 3 ft. in 1 yd. *Multiply 15 by 3*
So 15 yd. = 45 ft.

$$\begin{array}{r} 15 \\ \times 3 \\ \hline 45 \end{array}$$

(b) **Change 4 hr. 20 min. to minutes.**

There are 60 min. in 1 hr. *Multiply 60 $\times$ 4*
and *add 20.*
So 4 hr. 20 min. = 260 min.

$$\begin{array}{r} 60 \\ \times 4 \\ \hline 240 \\ + 20 \\ \hline 260 \end{array}$$

CHANGING SMALLER MEASURES TO LARGER MEASURES

(a) **Change 64 oz. to pounds.**

There are 16 oz. in 1 lb. *Divide 64 by 16*
So 64 oz. = 4 lb.

$$\begin{array}{r} 4 \\ 16 \overline{)64} \\ \underline{64} \end{array}$$

(b) **Change 26 qt. to gallons.**

There are 4 qt. in 1 gal. *Divide 26 by 4.*
If there is a remainder it will be quarts.
So 26 qt. = 6 gal. 2 qt.

$$\begin{array}{r} 6 \\ 4 \overline{)26} \\ \underline{24} \\ 2 \end{array}$$

Change:

- | | |
|----------------------------------|--------------------------------|
| 1. 5 ft. to inches | 2. 10 qt. to pints |
| 3. 6 wk. to days | 4. $2\frac{1}{2}$ T. to pounds |
| 5. 8 min. 12 sec. to seconds | 6. 3 bu. 1 pk. to pecks |
| 7. 5 lb. 14 oz. to ounces | 8. 2 rd. 3 yd. to yards |
| 9. 42 da. to weeks | 10. 64 pk. to bushels |
| 11. 96 hr. to days | 12. 156 ft. to yards |
| 13. 11 qt. to gallons and quarts | 14. 55 da. to weeks and days |

15. Bob measured the length of his fishing line. It was 31 yd. 2 ft. How many feet long was Bob's line?

16. If summer vacation was 80 days, how long was it in weeks and days?

ADDING MEASURES

Nell's mother bought 3 chickens to cook for the Church fair. One chicken weighed 4 lb. 11 oz.; another 5 lb. 8 oz.; and the other 5 lb. 6 oz. How much did the 3 chickens weigh altogether?

To find how much the 3 chickens weighed we add the weights.

$$\begin{array}{r} 4 \text{ lb. } 11 \text{ oz.} \\ 5 \text{ lb. } 8 \text{ oz.} \\ 5 \text{ lb. } 6 \text{ oz.} \\ \hline 15 \text{ lb. } 9 \text{ oz.} \end{array}$$

Write the measures as shown.

Start at the right. Add the ounces.

The sum of the ounces is 25 oz. which is more than 1 lb. Divide 25 by 16. So 25 oz. = 1 lb. 9 oz.

Write 9 oz. under the ounces. Carry the 1 lb. and add it to the pounds column. Add the pounds. The sum of the pounds is 15 lb. Write 15 lb. under the pounds.

So the 3 chickens weighed 15 lb. 9 oz.

$$\begin{array}{r} 1 \\ 16 \overline{)25} \\ \underline{16} \\ 9 \end{array}$$

Add. Check each exercise.

- | | | |
|--|--|--|
| 1. 3 ft. 4 in.
<u>2 ft. 5 in.</u> | 8 lb. 3 oz.
<u>6 lb. 10 oz.</u> | 5 bu. 2 pk.
<u>7 bu. 3 pk.</u> |
| 2. 10 hr. 40 min.
<u>2 hr. 25 min.</u> | 3 wk. 4 da.
<u>9 wk. 3 da.</u> | 16 yd. 2 ft.
<u>8 yd. 2 ft.</u> |
| 3. 8 qt. 1 pt.
4 qt. 1 pt.
<u>2 qt. 1 pt.</u> | 5 sq. yd. 6 sq. ft.
6 sq. yd. 2 sq. ft.
<u>4 sq. yd. 4 sq. ft.</u> | 3 T. 1650 lb.
2 T. 700 lb.
<u>1 T. 950 lb.</u> |

4. Yesterday Fred studied History for 1 hr. 25 min.; and English for 1 hr. 35 min. How long did Fred study yesterday?

5. Mrs. Dodd bought 3 pieces of curtain material for her new home. One piece was 9 yd. 2 ft. long; another, 7 yd. 2 ft. long; and the other 8 yd. 1 ft. long. How much curtain material did she buy?

SUBTRACTING MEASURES

Susan and Ann are taking piano lessons. Last week Susan practised 8 hr. 15 min. Ann practised 6 hr. 45 min. How much longer did Susan practise than Ann?
To find how much longer Susan practised we *subtract* 6 hr. 45 min. from 8 hr. 15 min.

$$\begin{array}{r} 8 \text{ hr. } 15 \text{ min.} = 7 \text{ hr. } 75 \text{ min.} \\ 6 \text{ hr. } 45 \text{ min.} = 6 \text{ hr. } 45 \text{ min.} \\ \hline 1 \text{ hr. } 30 \text{ min.} \end{array}$$

Write the measure as shown. Start at the right. We cannot subtract 45 min. from 15 min.

Borrow 1 hr. from 8 hr. and change 1 hr. to 60 min. Add 15 min. and 60 min. giving 75 min. Write 8 hr. 15 min. as 7 hr. 75 min. Now subtract as shown.
So Susan practised 1 hr. 30 min. longer than Ann.

Subtract. Check each exercise.

- | | | |
|--|---|---|
| 1. $\begin{array}{r} 7 \text{ yd. } 2 \text{ ft.} \\ 3 \text{ yd. } 1 \text{ ft.} \\ \hline \end{array}$ | 9 gal. 3 qt.
$\begin{array}{r} 4 \text{ gal. } 1 \text{ qt.} \\ \hline \end{array}$ | 8 bu. 1 pk.
$\begin{array}{r} 6 \text{ bu. } 3 \text{ pk.} \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 5 \text{ lb. } 6 \text{ oz.} \\ 2 \text{ lb. } 10 \text{ oz.} \\ \hline \end{array}$ | 12 hr. 15 min.
$\begin{array}{r} 8 \text{ hr. } 35 \text{ min.} \\ \hline \end{array}$ | 13 ft. 4 in.
$\begin{array}{r} 10 \text{ ft. } 9 \text{ in.} \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 30 \text{ min. } 10 \text{ sec.} \\ 18 \text{ min. } 55 \text{ sec.} \\ \hline \end{array}$ | 8 T. 500 lb.
$\begin{array}{r} 3 \text{ T. } 900 \text{ lb.} \\ \hline \end{array}$ | 22 da. 7 hr.
$\begin{array}{r} 16 \text{ da. } 12 \text{ hr.} \\ \hline \end{array}$ |

4. From a rope 15 ft. 3 in. long, Molly cut 7 ft. 9 in. to make a skipping rope. How long was the piece of rope that was left?

5. On a berry picking trip Jim picked 3 gal. and 1 qt. of blueberries. His younger brother, Fred, picked 2 gal. and 3 qt. How much more did Jim pick?

6. Larry and his father went fishing on Loon Lake. Larry's father caught a trout that weighed 3 lb. 2 oz. The largest trout that Larry caught weighed 1 lb. 7 oz. How much heavier was the trout that Larry's father caught?



BUYING AT WILSON'S COUNTRY STORE

Tony works at Wilson's country store. Before Mr. Wilson gave Tony his job he made sure Tony could add and subtract measures. Below are some problems Tony had to do on his job.

1. Mrs. Evans wanted a roast of beef. Tony showed her a roast that weighed 6 lb. 4 oz. and another that weighed 4 lb. 13 oz. What was the difference in the weights of the roasts?

2. Mrs. Gregg bought 2 remnants of cloth. One piece was 3 yd. 2 ft. long, and the other 5 yd. 2 ft. How much cloth did she buy altogether?

3. In the molasses barrel there were 14 gal. 2 qt. on Monday morning. That day, Tony sold 5 gal. 3 qt. How much molasses was left in the barrel?

4. On Monday, Tony sold 9 qt. 1 pt. of ice-cream; on Tuesday, 7 qt. 1 pt.; and on Wednesday, 11 qt. 1 pt. How much ice-cream did he sell in the three days?

5. In the oat bin there were 11 bu. 1 pk. of oats. Tony sold 6 bu. 3 pk. How much was left in the bin?

6. Tony goes to work at 7.30 a.m. and goes to dinner at 11.45 a.m. He comes to work again at 1.15 p.m. and is through for the day at 5.30 p.m. How long does Tony work every day? (Hint: Write 7.30 as 7 hr. 30 min.; etc.)

PRACTICE IN DIVISION OF DECIMALS

Divide. Check each answer.

1. $2\overline{)84}$

5. $5\overline{)75}$

6. $6\overline{)804}$

4. $4\overline{)748}$

2. $6\overline{)9.24}$

4. $4\overline{)144.8}$

5. $5\overline{)3.5}$

7. $7\overline{)3.01}$

3. $34\overline{)897.6}$

62. $62\overline{)249.86}$

28. $28\overline{)3.92}$

75. $75\overline{)26.25}$

4. $6.7\overline{)102.51}$

2.49. $2.49\overline{)8.964}$

.621. $.621\overline{)1.5525}$

8.7. $8.7\overline{)391.5}$

5. $4.13\overline{)70.21}$

9.46. $9.46\overline{)198.66}$

.72. $.72\overline{).504}$

.53. $.53\overline{).1272}$

6. $.35\overline{)10.5}$

.82. $.82\overline{)32.8}$

.575. $.575\overline{)11.5}$

.049. $.049\overline{)1.96}$

7. $.007\overline{)2.1}$

.004. $.004\overline{)3.6}$

.002. $.002\overline{).32}$

.003. $.003\overline{).51}$

8. $.6\overline{)24}$

.23. $.23\overline{)69}$

.04. $.04\overline{)2}$

.75. $.75\overline{)9}$

9. $.25\overline{)18}$

8. $8\overline{).56}$

5. $5\overline{).065}$

7.6. $7.6\overline{).456}$

10. $74\overline{)2.96}$

59. $59\overline{).295}$

.4. $.4\overline{).012}$

45. $45\overline{).09}$

Round the quotients to the nearest tenth:

11. $4\overline{).71}$

38. $38\overline{)6.49}$

7.2. $7.2\overline{)34.83}$

2.65. $2.65\overline{)11.7}$

Round the quotients to the nearest hundredth:

12. $3\overline{).851}$

.8. $.8\overline{).965}$

7.6. $7.6\overline{)39.05}$

5.04. $5.04\overline{)22.3}$

Divide. Express the remainders as decimals to the nearest hundredth:

13. $4\overline{)15}$

9. $9\overline{)38}$

23. $23\overline{)39}$

56. $56\overline{)105}$

MULTIPLYING MEASURES

Dick's father made new steps up to the front porch. If there were 5 steps and each step was 4 ft. 7 in. long, how much lumber did he need for the steps?

To find how much lumber he needed we *multiply* 4 ft. 7 in. by 5.

$$\begin{array}{r} 4 \text{ ft. } 7 \text{ in.} \\ \times 5 \\ \hline 22 \text{ ft. } 11 \text{ in.} \end{array}$$

Write the measures as shown.

Start at right. Multiply the inches.

$$5 \times 7 \text{ in.} = 35 \text{ in.}$$

35 in. is more than a foot.

Divide 35 by 12. So 35 in. = 2 ft. 11 in. Write the 11 in. under inches. Multiply 4 ft. by 5 and carry the 2 ft. giving 22 ft.;

So Dick's father needed 22 ft. 11 in. of lumber.

$$\begin{array}{r} 2 \\ 12 \overline{)35} \\ \underline{24} \\ 11 \end{array}$$

Multiply. Check each exercise.

$$\begin{array}{r} 1. \quad 2 \text{ ft. } 3 \text{ in.} \\ \times 3 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \text{ wk. } 2 \text{ day} \\ \times 2 \\ \hline \end{array}$$

$$\begin{array}{r} 2 \text{ qt. } 1 \text{ pt.} \\ \times 5 \\ \hline \end{array}$$

$$\begin{array}{r} 2. \quad 5 \text{ lb. } 4 \text{ oz.} \\ \times 4 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \text{ bu. } 2 \text{ pk.} \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 10 \text{ hr. } 12 \text{ min.} \\ \times 5 \\ \hline \end{array}$$

$$\begin{array}{r} 3. \quad 16 \text{ yd. } 2 \text{ ft.} \\ \times 8 \\ \hline \end{array}$$

$$\begin{array}{r} 15 \text{ min. } 40 \text{ sec.} \\ \times 9 \\ \hline \end{array}$$

$$\begin{array}{r} 21 \text{ gal. } 3 \text{ qt.} \\ \times 7 \\ \hline \end{array}$$

$$\begin{array}{r} 4. \quad 24 \text{ wk. } 6 \text{ da.} \\ \times 6 \\ \hline \end{array}$$

$$\begin{array}{r} 6 \text{ lb. } 2\frac{1}{2} \text{ oz.} \\ \times 8 \\ \hline \end{array}$$

$$\begin{array}{r} 8 \text{ rd. } 3 \text{ yd.} \\ \times 5 \\ \hline \end{array}$$

5. Miss Morgan, the teacher, helped her pupils to decorate the classroom for Christmas. She pinned 4 pieces of crepe paper along the top of the blackboard. If each piece of crepe paper was 5 ft. 4 in. long, how long was the blackboard?

6. Elsie sleeps 9 hr. 30 min. every night. How long does Elsie sleep in a week?

7. The Smith family uses 2 qt. 1 pt. of milk a day. How much milk do they use in 6 days?

DIVIDING MEASURES

Farmer Jackson dug 10 bu. 2 pk. of potatoes for a dealer. He shipped them in 6 bags with the same amount of potatoes in each bag. How much did each bag hold?

To find out how much each bag held we *divide* 10 bu. 2 pk. by 6.

$\begin{array}{r} 1 \text{ bu. } 3 \text{ pk.} \\ 6 \overline{)10 \text{ bu. } 2 \text{ pk.}} \end{array}$
--

Write the measures as shown. Start at the left.

Divide the bushels. $10 \text{ bu.} \div 6$ is 1 bu. and 4 bu. left over.

Write the 1 bu. above bushels. Change the 4 bu. left over to pecks. Multiply by 4. $4 \text{ bu.} = 16 \text{ pk.}$ Add 2 pk. to 16 pk. making 18 pk. Divide the pecks. $18 \text{ pk.} \div 6 = 3 \text{ pk.}$

Write the 3 pk. above the pecks.

So each bag held 1 bu. 3 pk. of potatoes.

Divide.

Check each exercise

exercise

- | | | |
|---|---|---|
| 1. $2 \overline{)8 \text{ ft. } 10 \text{ in.}}$ | 4. $4 \overline{)12 \text{ da. } 16 \text{ hr.}}$ | 3. $3 \overline{)7 \text{ wk. } 5 \text{ da.}}$ |
| 2. $5 \overline{)12 \text{ gal. } 2 \text{ qt.}}$ | 7. $7 \overline{)23 \text{ lb. } 10 \text{ oz.}}$ | 6. $6 \overline{)52 \text{ min. } 12 \text{ sec.}}$ |
| 3. $7 \overline{)22 \text{ bu. } 3 \text{ pk.}}$ | 4. $4 \overline{)62 \text{ yd. } 2 \text{ ft.}}$ | 9. $9 \overline{)30 \text{ hr. } 27 \text{ min.}}$ |
| 4. $5 \overline{)22 \text{ qt. } 1 \text{ pt.}}$ | 8. $8 \overline{)9 \text{ doz. } 4 \text{ things}}$ | 7. $7 \overline{)12 \text{ ft. } 3 \text{ in.}}$ |
| 5. $9 \overline{)130 \text{ pt. } 1 \text{ cup}}$ | 3. $3 \overline{)4 \text{ mi. } 34 \text{ rd.}}$ | 15. $15 \overline{)36 \text{ yr. } 3 \text{ mo.}}$ |

6. When Mrs. McDonald got her grocery order yesterday she had 6 lb. 8 oz. of turnips. If there were 4 turnips what was their average weight?

7. Joe cut a log which was 19 ft. 3 in. long into 7 equal pieces. How long was each piece?

8. The total weight of the 5 boys on the school basketball team was 462 lb. 3 oz. What was the average weight of the boys?



PROBLEMS USING MEASURES

1. In the picture above you see boys practising the broad jump for the school track meet. Bill jumped 14 ft. 3 in., and Roy jumped 12 ft. 11 in. How much farther did Bill jump than Roy?

2. In a mile relay race each of the four boys on the Central School team ran one-quarter of a mile. Steve took 2 min. 14 sec.; Paul, 2 min. 9 sec.; Norman, 1 min. 57 sec.; and Dave, 1 min. 49 sec. How long did it take the relay team to run a mile?

3. The net weight of a box of salt is 1 lb. 8 oz. What is the net weight of 6 boxes?

4. Mr. Snook drove his automobile 9 mi. in 13 min. 21 sec. At that rate how long did it take to go 1 mi.?

5. Sally is 13 yr. 2 mo. old. Her sister is 9 yr. 8 mo. How much older is Sally than her sister?

6. Mrs. Ryan picked 8 pk. 2 qt. of tomatoes from her garden. If she divided them evenly into 6 baskets, how much did each basket hold?

7. There are five boys on the school basketball team. Jim is 5 ft. 5 in. tall; Phillip, 5 ft. 6 in.; Allan, 4 ft. 10 in.; Peter, 4 ft. 11 in.; and Ronald, 5 ft. 7 in. What is the average height of the boys?

KEEPING THE TOOLS SHARP

Add Check each exercise.

1.	3.6	25.43	.734	7.54	.214
	5.2	6.67	.655	83.42	7.047
	8.7	32.74	.083	.37	62.926
	3.5	5.20	.376	6.94	9.073
	7.3	84.57	.539	.28	.305
	<u>4.6</u>	<u>18.93</u>	<u>.044</u>	<u>54.63</u>	<u>51.469</u>

Subtract. Check each exercise.

2.	41.7	9.02	62.40	5.575	66.431		
	<u>26.4</u>	<u>6.45</u>	<u>58.73</u>	<u>3.693</u>	<u>26.577</u>		
3.	.8	.9	.56	.84	.06	.03	.15
	<u>.5</u>	<u>.8</u>	<u>.12</u>	<u>.49</u>	<u>.03</u>	<u>.01</u>	<u>.09</u>
4.	.12	.624	.051	.172	.008	.715	
	<u>.06</u>	<u>.355</u>	<u>.023</u>	<u>.078</u>	<u>.004</u>	<u>.687</u>	

5. $15 - .67$

6. $31 - 8.045$

Multiply. Check each exercise.

7.	.4	2.8	.65	3.92	.607	43.186
	<u>2</u>	<u>3</u>	<u>7</u>	<u>18</u>	<u>68</u>	<u>49</u>
8.	.3	19	45	82	567	684
	<u>.3</u>	<u>.6</u>	<u>2.5</u>	<u>.57</u>	<u>1.94</u>	<u>.253</u>
9.	.9	.76	28.4	4.96	3.82	59.3
	<u>.5</u>	<u>.4</u>	<u>9.3</u>	<u>.6</u>	<u>1.27</u>	<u>2.74</u>
10.	.2	.1	.03	.18	.025	.03
	<u>.4</u>	<u>.5</u>	<u>.3</u>	<u>.4</u>	<u>.3</u>	<u>.02</u>

Divide. Check each answer.

11. $8 \overline{)936}$ $13 \overline{)94.12}$ $.52 \overline{)3.276}$ $3.15 \overline{)15.75}$

12. $.7 \overline{)28}$ $1.25 \overline{)10}$ $4.7 \overline{).235}$ $75 \overline{)1.5}$

PRACTICE IN DIVISION OF DECIMALS

Divide. Check each answer.

- | | | | |
|-----------------------------|---------------------------------|---------------------------------|-------------------------------|
| 1. $3\overline{) .93}$ | 6. $6\overline{) .84}$ | 4. $4\overline{) .756}$ | 5. $5\overline{) .935}$ |
| 2. $5\overline{) 8.15}$ | 7. $7\overline{) 92.4}$ | 9. $9\overline{) 6.3}$ | 6. $6\overline{) 5.04}$ |
| 3. $23\overline{) 814.2}$ | 41. $41\overline{) 289.46}$ | 54. $54\overline{) 19.44}$ | 27. $27\overline{) 10.26}$ |
| 4. $7.2\overline{) 182.88}$ | 5.37. $5.37\overline{) 13.962}$ | .413. $.413\overline{) 1.7346}$ | 9.4. $9.4\overline{) 338.4}$ |
| 5. $2.25\overline{) 29.25}$ | 7.18. $7.18\overline{) 387.72}$ | .34. $.34\overline{) .272}$ | .62. $.62\overline{) .1922}$ |
| 6. $.43\overline{) 25.8}$ | .29. $.29\overline{) 5.8}$ | .425. $.425\overline{) 34.5}$ | .076. $.076\overline{) 1.52}$ |
| 7. $.003\overline{) 1.8}$ | .008. $.008\overline{) 4.8}$ | .005. $.005\overline{) .65}$ | .006. $.006\overline{) .84}$ |
| 8. $.7\overline{) 28}$ | .13. $.13\overline{) 26}$ | .08. $.08\overline{) 4}$ | .25. $.25\overline{) 6}$ |
| 9. $2.5\overline{) 12}$ | 9. $9\overline{) .54}$ | 4. $4\overline{) .056}$ | 8.2. $8.2\overline{) .246}$ |
| 10. $61\overline{) 3.05}$ | 37. $37\overline{) .074}$ | 6. $6\overline{) .036}$ | 55. $55\overline{) .022}$ |

Round the quotients to the nearest tenth:

- | | | | |
|-------------------------|---------------------------|------------------------------|------------------------------|
| 11. $7\overline{) .83}$ | 26. $26\overline{) 4.21}$ | 8.4. $8.4\overline{) 56.37}$ | 1.95. $1.95\overline{) 6.8}$ |
|-------------------------|---------------------------|------------------------------|------------------------------|

Round the quotients to the nearest hundredth:

- | | | | |
|--------------------------|---------------------------|------------------------------|------------------------------|
| 12. $5\overline{) .682}$ | .3. $.3\overline{) .704}$ | 6.4. $6.4\overline{) 29.53}$ | 2.31. $2.31\overline{) 4.9}$ |
|--------------------------|---------------------------|------------------------------|------------------------------|

Divide. Express the remainders as decimals to the nearest hundredth:

- | | | | |
|------------------------|-----------------------|-------------------------|-------------------------|
| 13. $8\overline{) 34}$ | 6. $6\overline{) 35}$ | 14. $14\overline{) 37}$ | 37. $37\overline{) 79}$ |
|------------------------|-----------------------|-------------------------|-------------------------|

PRACTICE WITH MEASURES

Add. Check each exercise.

- | | | |
|---|--|--|
| 1. $\begin{array}{r} 6 \text{ ft. } 5 \text{ in.} \\ 3 \text{ ft. } 4 \text{ in.} \\ \hline \end{array}$ | $\begin{array}{r} 4 \text{ hr. } 20 \text{ min.} \\ 8 \text{ hr. } 17 \text{ min.} \\ \hline \end{array}$ | $\begin{array}{r} 5 \text{ bu. } 3 \text{ pk.} \\ 4 \text{ bu. } 3 \text{ pk.} \\ \hline \end{array}$ |
| 2. $\begin{array}{r} 2 \text{ wk. } 6 \text{ da.} \\ 9 \text{ wk. } 5 \text{ da.} \\ \hline \end{array}$ | $\begin{array}{r} 9 \text{ lb. } 11 \text{ oz.} \\ 6 \text{ lb. } 13 \text{ oz.} \\ \hline \end{array}$ | $\begin{array}{r} 8 \text{ yd. } 2 \text{ ft.} \\ 7 \text{ yd. } 1 \text{ ft.} \\ \hline \end{array}$ |
| 3. $\begin{array}{r} 4 \text{ qt. } 1 \text{ pt.} \\ 6 \text{ qt. } 1 \text{ pt.} \\ 5 \text{ qt. } 1 \text{ pt.} \\ \hline \end{array}$ | $\begin{array}{r} 7 \text{ min. } 40 \text{ sec.} \\ 4 \text{ min. } 32 \text{ sec.} \\ 9 \text{ min. } 55 \text{ sec.} \\ \hline \end{array}$ | $\begin{array}{r} 2 \text{ T. } 350 \text{ lb.} \\ 4 \text{ T. } 800 \text{ lb.} \\ 6 \text{ T. } 900 \text{ lb.} \\ \hline \end{array}$ |

Subtract. Check each exercise.

- | | | |
|---|---|--|
| 4. $\begin{array}{r} 5 \text{ wk. } 4 \text{ da.} \\ 3 \text{ wk. } 1 \text{ da.} \\ \hline \end{array}$ | $\begin{array}{r} 8 \text{ lb. } 12 \text{ oz.} \\ 4 \text{ lb. } 7 \text{ oz.} \\ \hline \end{array}$ | $\begin{array}{r} 9 \text{ yd. } 1 \text{ ft.} \\ 2 \text{ yd. } 2 \text{ ft.} \\ \hline \end{array}$ |
| 5. $\begin{array}{r} 7 \text{ gal. } 1 \text{ qt.} \\ 1 \text{ gal. } 3 \text{ qt.} \\ \hline \end{array}$ | $\begin{array}{r} 12 \text{ yr. } 4 \text{ mo.} \\ 8 \text{ yr. } 9 \text{ mo.} \\ \hline \end{array}$ | $\begin{array}{r} 8 \text{ bu. } 2 \text{ pk.} \\ 5 \text{ bu. } 3 \text{ pk.} \\ \hline \end{array}$ |
| 6. $\begin{array}{r} 9 \text{ ft. } 5 \text{ in.} \\ 7 \text{ ft. } 10 \text{ in.} \\ \hline \end{array}$ | $\begin{array}{r} 22 \text{ min. } 15 \text{ sec.} \\ 16 \text{ min. } 43 \text{ sec.} \\ \hline \end{array}$ | $\begin{array}{r} 9 \text{ doz. } 4 \text{ things} \\ 6 \text{ doz. } 10 \text{ things} \\ \hline \end{array}$ |

Multiply. Check each exercise.

- | | | |
|--|--|---|
| 7. $\begin{array}{r} 5 \text{ yr. } 3 \text{ mo.} \\ \times 3 \\ \hline \end{array}$ | $\begin{array}{r} 6 \text{ ft. } 2 \text{ in.} \\ \times 5 \\ \hline \end{array}$ | $\begin{array}{r} 3 \text{ gal. } 2 \text{ qt.} \\ \times 7 \\ \hline \end{array}$ |
| 8. $\begin{array}{r} 4 \text{ yd. } 2 \text{ ft.} \\ \times 4 \\ \hline \end{array}$ | $\begin{array}{r} 7 \text{ qt. } 1 \text{ pt.} \\ \times 8 \\ \hline \end{array}$ | $\begin{array}{r} 8 \text{ lb. } 6 \text{ oz.} \\ \times 9 \\ \hline \end{array}$ |
| 9. $\begin{array}{r} 12 \text{ wk. } 5 \text{ da.} \\ \times 6 \\ \hline \end{array}$ | $\begin{array}{r} 16 \text{ bu. } 2 \text{ pk.} \\ \times 9 \\ \hline \end{array}$ | $\begin{array}{r} 36 \text{ min. } 18 \text{ sec.} \\ \times 8 \\ \hline \end{array}$ |

Divide. Check each exercise.

- | | | |
|--|---|---|
| 10. $\overline{3)9 \text{ lb. } 12 \text{ oz.}}$ | $\overline{4)16 \text{ yr. } 8 \text{ mo.}}$ | $\overline{5)12 \text{ qt. } 1 \text{ pt.}}$ |
| 11. $\overline{6)9 \text{ yd. } 3 \text{ ft.}}$ | $\overline{8)22 \text{ wk. } 6 \text{ da.}}$ | $\overline{7)38 \text{ lb. } 1 \text{ oz.}}$ |
| 12. $\overline{9)51 \text{ gal. } 3 \text{ qt.}}$ | $\overline{8)54 \text{ min. } 16 \text{ sec.}}$ | $\overline{13)44 \text{ ft. } 5 \text{ in.}}$ |

KEEPING THE TOOLS SHARP

Add. Check each exercise.

1.	6123	5735	2703	1078	8539
	8484	9286	5639	7502	2305
	2806	3040	7984	6484	7924
	9440	5873	4307	1050	2606
	2005	8535	2834	3272	6210
	<u>5391</u>	<u>8186</u>	<u>5225</u>	<u>6789</u>	<u>7407</u>
2.	2914	6054	3940	6615	9408
	4035	5647	2681	3709	6397
	5277	3475	2055	7821	1563
	9360	8080	9480	4506	3205
	8038	6134	7333	6910	9949
	<u>4519</u>	<u>9070</u>	<u>1270</u>	<u>2723</u>	<u>1278</u>

Subtract. Check each exercise.

3.	35673	66419	65481	97254	33563
	<u>29279</u>	<u>24735</u>	<u>55597</u>	<u>63839</u>	<u>14276</u>
4.	62430	74208	81700	53002	22000
	<u>19163</u>	<u>68214</u>	<u>79143</u>	<u>13384</u>	<u>15724</u>
5.	74148	45316	81413	81117	91010
	<u>18673</u>	<u>35759</u>	<u>72685</u>	<u>27918</u>	<u>12734</u>
6.	36105	85010	32102	65005	31410
	<u>25060</u>	<u>57107</u>	<u>16005</u>	<u>29058</u>	<u>29748</u>
7.	86872	15418	70300	81014	91003
	<u>24946</u>	<u>13946</u>	<u>39863</u>	<u>14376</u>	<u>86254</u>

KEEPING THE TOOLS SHARP

Multiply.

Check each exercise.

1. $\begin{array}{r} 812 \\ \underline{4} \end{array}$	$\begin{array}{r} 601 \\ \underline{7} \end{array}$	$\begin{array}{r} 928 \\ \underline{3} \end{array}$	$\begin{array}{r} 304 \\ \underline{6} \end{array}$	$\begin{array}{r} 451 \\ \underline{9} \end{array}$	$\begin{array}{r} 720 \\ \underline{7} \end{array}$
--	---	---	---	---	---

2. $\begin{array}{r} 2170 \\ \underline{5} \end{array}$	$\begin{array}{r} 3121 \\ \underline{8} \end{array}$	$\begin{array}{r} 8734 \\ \underline{2} \end{array}$	$\begin{array}{r} 1602 \\ \underline{4} \end{array}$	$\begin{array}{r} 5700 \\ \underline{8} \end{array}$
---	--	--	--	--

3. $\begin{array}{r} 576 \\ \underline{6} \end{array}$	$\begin{array}{r} 398 \\ \underline{9} \end{array}$	$\begin{array}{r} 945 \\ \underline{7} \end{array}$	$\begin{array}{r} 694 \\ \underline{8} \end{array}$	$\begin{array}{r} 756 \\ \underline{3} \end{array}$	$\begin{array}{r} 489 \\ \underline{5} \end{array}$
--	---	---	---	---	---

4. $\begin{array}{r} 5374 \\ \underline{4} \end{array}$	$\begin{array}{r} 3947 \\ \underline{3} \end{array}$	$\begin{array}{r} 1298 \\ \underline{6} \end{array}$	$\begin{array}{r} 4396 \\ \underline{5} \end{array}$	$\begin{array}{r} 1762 \\ \underline{9} \end{array}$
---	--	--	--	--

5. $\begin{array}{r} 4639 \\ \underline{2} \end{array}$	$\begin{array}{r} 8702 \\ \underline{7} \end{array}$	$\begin{array}{r} 5812 \\ \underline{8} \end{array}$	$\begin{array}{r} 6923 \\ \underline{4} \end{array}$	$\begin{array}{r} 7613 \\ \underline{6} \end{array}$
---	--	--	--	--

6. $\begin{array}{r} 278 \\ \underline{50} \end{array}$	$\begin{array}{r} 478 \\ \underline{90} \end{array}$	$\begin{array}{r} 641 \\ \underline{30} \end{array}$	$\begin{array}{r} 528 \\ \underline{24} \end{array}$	$\begin{array}{r} 395 \\ \underline{67} \end{array}$	$\begin{array}{r} 163 \\ \underline{18} \end{array}$
---	--	--	--	--	--

7. $\begin{array}{r} 1485 \\ \underline{16} \end{array}$	$\begin{array}{r} 3647 \\ \underline{28} \end{array}$	$\begin{array}{r} 2635 \\ \underline{59} \end{array}$	$\begin{array}{r} 7264 \\ \underline{73} \end{array}$	$\begin{array}{r} 3497 \\ \underline{14} \end{array}$
--	---	---	---	---

8. $\begin{array}{r} 591 \\ \underline{200} \end{array}$	$\begin{array}{r} 754 \\ \underline{400} \end{array}$	$\begin{array}{r} 863 \\ \underline{700} \end{array}$	$\begin{array}{r} 947 \\ \underline{900} \end{array}$	$\begin{array}{r} 195 \\ \underline{152} \end{array}$	$\begin{array}{r} 607 \\ \underline{384} \end{array}$
--	---	---	---	---	---

9. $\begin{array}{r} 826 \\ \underline{613} \end{array}$	$\begin{array}{r} 589 \\ \underline{278} \end{array}$	$\begin{array}{r} 605 \\ \underline{429} \end{array}$	$\begin{array}{r} 463 \\ \underline{387} \end{array}$	$\begin{array}{r} 908 \\ \underline{594} \end{array}$	$\begin{array}{r} 691 \\ \underline{435} \end{array}$
--	---	---	---	---	---

10. $\begin{array}{r} 472 \\ \underline{157} \end{array}$	$\begin{array}{r} 832 \\ \underline{369} \end{array}$	$\begin{array}{r} 927 \\ \underline{784} \end{array}$	$\begin{array}{r} 974 \\ \underline{926} \end{array}$	$\begin{array}{r} 805 \\ \underline{841} \end{array}$	$\begin{array}{r} 718 \\ \underline{657} \end{array}$
---	---	---	---	---	---

11. $\begin{array}{r} 457 \\ \underline{106} \end{array}$	$\begin{array}{r} 684 \\ \underline{408} \end{array}$	$\begin{array}{r} 938 \\ \underline{602} \end{array}$	$\begin{array}{r} 590 \\ \underline{307} \end{array}$	$\begin{array}{r} 806 \\ \underline{509} \end{array}$	$\begin{array}{r} 504 \\ \underline{205} \end{array}$
---	---	---	---	---	---

KEEPING THE TOOLS SHARP

Divide. Check each exercise.

- | | | | |
|------------------------------|---------------------------|---------------------------|--------------------------|
| ①. $4 \overline{)1756}$ | $6 \overline{)2304}$ | $8 \overline{)4893}$ | $5 \overline{)3747}$ |
| 2. $7 \overline{)5698}$ | $9 \overline{)1375}$ | $4 \overline{)3270}$ | $8 \overline{)6592}$ |
| ③. $6 \overline{)1542}$ | $8 \overline{)5270}$ | $9 \overline{)3502}$ | $7 \overline{)4629}$ |
| 4. $3 \overline{)2250}$ | $7 \overline{)4692}$ | $5 \overline{)4150}$ | $9 \overline{)7834}$ |
| ⑤. $6 \overline{)3042}$ | $4 \overline{)2818}$ | $8 \overline{)7243}$ | $7 \overline{)3521}$ |
| 6. $50 \overline{)2964}$ | $72 \overline{)1872}$ | $93 \overline{)2232}$ | $44 \overline{)2728}$ |
| 7. $32 \overline{)17440}$ | $83 \overline{)52075}$ | $64 \overline{)14976}$ | $73 \overline{)38549}$ |
| 8. $63 \overline{)3067}$ | $34 \overline{)1587}$ | $85 \overline{)3305}$ | $23 \overline{)1541}$ |
| 9. $87 \overline{)3664}$ | $59 \overline{)4295}$ | $78 \overline{)3062}$ | $37 \overline{)1278}$ |
| 10. $28 \overline{)18140}$ | $67 \overline{)24349}$ | $39 \overline{)17056}$ | $49 \overline{)31681}$ |
| 11. $36 \overline{)2672}$ | $58 \overline{)4176}$ | $47 \overline{)2961}$ | $26 \overline{)1473}$ |
| 12. $14 \overline{)1072}$ | $18 \overline{)1350}$ | $16 \overline{)1487}$ | $19 \overline{)1598}$ |
| 13. $24 \overline{)2277}$ | $44 \overline{)4372}$ | $63 \overline{)6284}$ | $75 \overline{)7485}$ |
| 14. $27 \overline{)14310}$ | $52 \overline{)23934}$ | $94 \overline{)62980}$ | $38 \overline{)14456}$ |
| 15. $72 \overline{)36288}$ | $49 \overline{)15104}$ | $17 \overline{)10234}$ | $84 \overline{)59572}$ |
| 16. $3 \overline{)\$19.35}$ | $8 \overline{)\$60.16}$ | $6 \overline{)\$20.40}$ | $9 \overline{)\$36.72}$ |
| 17. $45 \overline{)\$56.70}$ | $73 \overline{)\$255.50}$ | $54 \overline{)\$327.78}$ | $17 \overline{)\$46.75}$ |
| 18. $316 \overline{)18012}$ | $592 \overline{)27247}$ | $247 \overline{)50141}$ | |
| 19. $624 \overline{)157922}$ | $781 \overline{)351450}$ | $483 \overline{)153148}$ | |

KEEPING THE TOOLS SHARP

Add. Each answer must be in lowest terms.

- | | | | | | |
|--|--------------------------------------|-------------------------------------|--|---------------------------------------|---------------------------------------|
| 1. $\frac{6\frac{1}{5}}{2\frac{3}{4}}$ | $\frac{1\frac{2}{3}}{8\frac{1}{10}}$ | $\frac{9\frac{4}{5}}{7\frac{3}{4}}$ | $\frac{10\frac{3}{4}}{5\frac{2}{3}}$ | $\frac{8\frac{5}{6}}{12\frac{4}{5}}$ | $\frac{5\frac{1}{2}}{6\frac{3}{5}}$ |
| 2. $\frac{3\frac{1}{10}}{5\frac{1}{6}}$ | $\frac{2\frac{3}{8}}{9\frac{3}{10}}$ | $\frac{7\frac{3}{4}}{4\frac{5}{6}}$ | $\frac{13\frac{11}{12}}{7\frac{5}{9}}$ | $\frac{4\frac{1}{6}}{11\frac{4}{15}}$ | $\frac{8\frac{5}{9}}{9\frac{7}{12}}$ |
| 3. $\frac{2\frac{7}{8}}{6\frac{5}{8}}$ | $\frac{5\frac{2}{3}}{8\frac{7}{12}}$ | $\frac{3\frac{1}{4}}{2\frac{5}{6}}$ | $\frac{6\frac{2}{5}}{9\frac{3}{4}}$ | $\frac{14\frac{3}{4}}{5\frac{2}{3}}$ | $\frac{1\frac{7}{8}}{12\frac{1}{6}}$ |
| 4. $\frac{3\frac{1}{10}}{2\frac{7}{10}}$ | $\frac{4\frac{1}{2}}{5\frac{3}{8}}$ | $\frac{6\frac{2}{3}}{2\frac{1}{4}}$ | $\frac{8\frac{7}{8}}{10\frac{5}{8}}$ | $\frac{5\frac{4}{5}}{9\frac{1}{2}}$ | $\frac{12\frac{1}{8}}{1\frac{7}{12}}$ |
| | $\frac{1\frac{3}{10}}{3\frac{3}{4}}$ | $\frac{7\frac{1}{2}}{3\frac{3}{4}}$ | $\frac{3\frac{3}{4}}{11\frac{3}{10}}$ | $\frac{6\frac{3}{4}}{11\frac{3}{10}}$ | $\frac{6\frac{3}{4}}{11\frac{3}{10}}$ |

Subtract. Each answer must be in lowest terms.

- | | | | | | |
|---|--------------------------------------|--------------------------------------|---------------------------------------|--|--------------------------------------|
| 5. $\frac{3\frac{9}{10}}{1\frac{4}{5}}$ | $\frac{6\frac{1}{3}}{3\frac{5}{12}}$ | $\frac{9\frac{3}{16}}{5\frac{1}{2}}$ | $\frac{13\frac{1}{8}}{7\frac{3}{4}}$ | $\frac{6\frac{1}{16}}{5\frac{5}{8}}$ | $\frac{4\frac{5}{12}}{3\frac{5}{6}}$ |
| 6. $\frac{\frac{2}{3}}{\frac{1}{2}}$ | $\frac{\frac{4}{5}}{\frac{3}{4}}$ | $\frac{\frac{2}{3}}{\frac{1}{4}}$ | $\frac{\frac{5}{6}}{\frac{2}{5}}$ | $\frac{\frac{7}{10}}{\frac{1}{3}}$ | $\frac{\frac{1}{2}}{\frac{2}{5}}$ |
| 7. $\frac{5\frac{1}{4}}{3\frac{3}{5}}$ | $\frac{7\frac{2}{3}}{1\frac{5}{6}}$ | $\frac{10\frac{4}{5}}{4\frac{1}{2}}$ | $\frac{8\frac{1}{2}}{2\frac{1}{3}}$ | $\frac{11\frac{3}{4}}{9\frac{1}{5}}$ | $\frac{2\frac{2}{3}}{1\frac{3}{8}}$ |
| 8. $\frac{\frac{5}{6}}{3\frac{1}{10}}$ | $\frac{\frac{3}{8}}{1\frac{1}{6}}$ | $\frac{\frac{5}{6}}{3\frac{1}{4}}$ | $\frac{\frac{3}{4}}{3\frac{1}{10}}$ | $\frac{\frac{7}{8}}{5\frac{1}{2}}$ | $\frac{\frac{8}{9}}{1\frac{1}{6}}$ |
| 9. $\frac{9\frac{1}{4}}{2\frac{1}{6}}$ | $\frac{7\frac{1}{6}}{3\frac{7}{10}}$ | $\frac{4\frac{3}{8}}{1\frac{5}{6}}$ | $\frac{15\frac{1}{10}}{8\frac{3}{4}}$ | $\frac{16\frac{3}{12}}{12\frac{7}{9}}$ | $\frac{8\frac{1}{8}}{7\frac{5}{12}}$ |

KEEPING THE TOOLS SHARP

Multiply. Cancel when possible. Each answer must be in lowest terms.

- | | | | |
|--|------------------------------------|-------------------------------------|-------------------------------------|
| 1. $4 \times \frac{2}{5}$ | $9 \times \frac{1}{6}$ | $10 \times \frac{3}{4}$ | $6 \times \frac{2}{3}$ |
| 2. $\frac{3}{10} \times 3$ | $\frac{5}{8} \times 12$ | $\frac{7}{12} \times 15$ | $\frac{3}{16} \times 48$ |
| 3. $5 \times 2\frac{1}{2}$ | $7 \times 1\frac{1}{4}$ | $8 \times 3\frac{5}{6}$ | $12 \times 1\frac{5}{8}$ |
| 4. $6 \times 1\frac{2}{3}$ | $15 \times 3\frac{3}{5}$ | $3\frac{1}{2} \times 9$ | $1\frac{1}{6} \times 13$ |
| 5. $3\frac{3}{4} \times 15$ | $2\frac{3}{8} \times 11$ | $1\frac{4}{5} \times 25$ | $2\frac{5}{12} \times 36$ |
| 6. $\frac{1}{3} \times \frac{2}{3}$ | $\frac{4}{5} \times \frac{1}{5}$ | $\frac{1}{2} \times \frac{3}{4}$ | $\frac{5}{6} \times \frac{1}{3}$ |
| 7. $\frac{1}{10} \times \frac{5}{6}$ | $\frac{5}{8} \times \frac{7}{10}$ | $\frac{2}{3} \times \frac{3}{4}$ | $\frac{15}{16} \times \frac{4}{5}$ |
| 8. $\frac{3}{5} \times \frac{1}{4}$ | $\frac{7}{8} \times \frac{1}{2}$ | $\frac{1}{6} \times \frac{3}{5}$ | $\frac{5}{8} \times \frac{4}{15}$ |
| 9. $\frac{2}{3} \times 1\frac{2}{5}$ | $\frac{1}{2} \times 5\frac{1}{4}$ | $\frac{5}{8} \times 3\frac{1}{4}$ | $\frac{3}{10} \times 6\frac{1}{2}$ |
| 10. $\frac{4}{5} \times 3\frac{1}{3}$ | $\frac{7}{12} \times 1\frac{3}{5}$ | $\frac{5}{6} \times 2\frac{1}{4}$ | $\frac{3}{16} \times 6\frac{2}{3}$ |
| 11. $\frac{9}{10} \times 4\frac{4}{9}$ | $\frac{3}{8} \times 2\frac{2}{3}$ | $4\frac{1}{2} \times \frac{1}{2}$ | $1\frac{7}{8} \times \frac{3}{4}$ |
| 12. $4\frac{3}{5} \times \frac{1}{6}$ | $3\frac{2}{3} \times \frac{5}{16}$ | $1\frac{3}{5} \times \frac{1}{4}$ | $3\frac{1}{8} \times \frac{7}{10}$ |
| 13. $2\frac{1}{4} \times 1\frac{1}{2}$ | $4\frac{4}{5} \times \frac{7}{12}$ | $3\frac{3}{7} \times \frac{7}{8}$ | $7\frac{1}{5} \times \frac{5}{6}$ |
| 14. $3\frac{2}{3} \times 1\frac{3}{5}$ | $1\frac{1}{4} \times 2\frac{1}{2}$ | $4\frac{1}{2} \times 2\frac{5}{6}$ | $5\frac{1}{3} \times 5\frac{1}{2}$ |
| 15. $1\frac{1}{6} \times 2\frac{1}{5}$ | $4\frac{1}{3} \times 4\frac{1}{4}$ | $2\frac{1}{8} \times 3\frac{2}{3}$ | $6\frac{1}{2} \times 1\frac{2}{3}$ |
| 16. $3\frac{1}{3} \times 2\frac{1}{4}$ | $5\frac{1}{2} \times 2\frac{3}{5}$ | $1\frac{3}{10} \times 8\frac{2}{3}$ | $5\frac{1}{3} \times 1\frac{7}{8}$ |
| 17. $1\frac{5}{6} \times 3\frac{3}{4}$ | $2\frac{3}{8} \times 4\frac{4}{5}$ | $7\frac{1}{2} \times 3\frac{1}{10}$ | $1\frac{3}{5} \times 11\frac{2}{3}$ |
| 18. $5\frac{1}{3} \times 1\frac{1}{2}$ | $6\frac{3}{4} \times 2\frac{2}{9}$ | $5\frac{5}{6} \times 5\frac{1}{7}$ | $7\frac{1}{2} \times 3\frac{1}{5}$ |

KEEPING THE TOOLS SHARP

Divide. Cancel when possible. Each answer must be in lowest terms.

- | | | | |
|---------------------------------------|-----------------------------------|------------------------------------|-----------------------------------|
| 1. $2 \div \frac{1}{3}$ | $3 \div \frac{7}{10}$ | $4 \div 5\frac{1}{3}$ | $11 \div 2\frac{1}{5}$ |
| 2. $6 \div \frac{3}{8}$ | $1 \div 2\frac{2}{3}$ | $10 \div 6\frac{1}{4}$ | $9 \div 1\frac{1}{4}$ |
| 3. $13 \div 3\frac{1}{3}$ | $7 \div 3\frac{1}{5}$ | $\frac{5}{6} \div 2$ | $\frac{9}{10} \div 6$ |
| 4. $\frac{3}{8} \div 4$ | $\frac{15}{16} \div 3$ | $\frac{3}{4} \div 12$ | $3\frac{1}{2} \div 2$ |
| 5. $6\frac{3}{4} \div 12$ | $5\frac{1}{3} \div 4$ | $5\frac{1}{2} \div 8$ | $4\frac{7}{12} \div 11$ |
| 6. $1\frac{1}{2} \div 4$ | $8\frac{1}{6} \div 21$ | $\frac{3}{4} \div \frac{3}{16}$ | $\frac{1}{2} \div \frac{5}{8}$ |
| 7. $\frac{3}{8} \div \frac{11}{16}$ | $\frac{2}{3} \div \frac{3}{4}$ | $\frac{7}{12} \div \frac{3}{8}$ | $\frac{2}{3} \div \frac{1}{12}$ |
| 8. $\frac{4}{5} \div \frac{6}{7}$ | $\frac{15}{16} \div \frac{5}{8}$ | $\frac{3}{4} \div \frac{1}{3}$ | $\frac{5}{6} \div \frac{2}{5}$ |
| 9. $4\frac{1}{2} \div \frac{9}{10}$ | $1\frac{4}{5} \div \frac{3}{8}$ | $2\frac{1}{3} \div \frac{4}{5}$ | $3\frac{3}{4} \div \frac{15}{16}$ |
| 10. $4\frac{1}{6} \div \frac{5}{8}$ | $3\frac{3}{8} \div \frac{9}{10}$ | $2\frac{3}{8} \div \frac{2}{3}$ | $6\frac{2}{3} \div \frac{5}{6}$ |
| 11. $6\frac{3}{4} \div \frac{6}{7}$ | $1\frac{7}{8} \div \frac{3}{5}$ | $\frac{3}{10} \div 2\frac{1}{2}$ | $\frac{5}{6} \div 1\frac{3}{7}$ |
| X 12. $\frac{4}{5} \div 1\frac{1}{2}$ | $\frac{1}{3} \div 1\frac{1}{7}$ | $\frac{7}{16} \div 1\frac{1}{8}$ | $\frac{3}{4} \div 2\frac{2}{3}$ |
| 13. $\frac{5}{12} \div 3\frac{3}{4}$ | $\frac{1}{2} \div 1\frac{2}{3}$ | $\frac{3}{4} \div 2\frac{2}{5}$ | $\frac{7}{8} \div 5\frac{1}{4}$ |
| 14. $7\frac{1}{2} \div 1\frac{1}{2}$ | $5\frac{2}{5} \div 2\frac{1}{4}$ | $3\frac{1}{3} \div 2\frac{1}{2}$ | $4\frac{1}{2} \div 1\frac{1}{3}$ |
| 15. $3\frac{2}{3} \div 1\frac{3}{7}$ | $4\frac{1}{3} \div 5\frac{1}{5}$ | $10\frac{4}{5} \div 2\frac{7}{10}$ | $2\frac{5}{6} \div 4\frac{1}{4}$ |
| 16. $1\frac{1}{2} \div 2\frac{1}{3}$ | $11\frac{1}{2} \div 3\frac{5}{6}$ | $6\frac{3}{4} \div 4\frac{1}{2}$ | $4\frac{5}{16} \div 5\frac{3}{4}$ |
| 17. $8\frac{1}{8} \div 3\frac{1}{4}$ | $5\frac{1}{4} \div 2\frac{1}{2}$ | $7\frac{1}{2} \div 9\frac{3}{8}$ | $8\frac{1}{4} \div 1\frac{3}{8}$ |
| 18. $3\frac{1}{8} \div 3\frac{9}{16}$ | $6\frac{3}{8} \div 3\frac{2}{5}$ | $4\frac{3}{4} \div 7\frac{3}{5}$ | $2\frac{5}{8} \div 12\frac{3}{5}$ |

KEEPING THE TOOLS SHARP

Add. Check each exercise.

~~1.~~	7.3	5.34	9.156	34.65	.476
	5.4	23.75	4.808	.53	26.067
	3.0	9.03	8.380	6.49	.930
	8.6	73.56	3.046	.96	3.204
	<u>7.5</u>	<u>4.27</u>	<u>5.972</u>	<u>93.27</u>	<u>52.715</u>

2.	.6	.02	.05	.037	.008	.003
	.2	.01	.06	.015	.006	.629
	.7	.04	.03	.002	.007	.044
	<u>.8</u>	<u>.02</u>	<u>.09</u>	<u>.013</u>	<u>.009</u>	<u>.502</u>

3. $.65 + 7.21 + 2.79 + .07 + 1.34$

4. $21.746 + 5.464 + .008 + 23.135 + .026$

5. $.004 + .043 + .012 + .027 + .011$

Subtract. Check each exercise.

6.	7.1	41.3	8.05	64.09	54.522
	<u>3.5</u>	<u>35.7</u>	<u>4.28</u>	<u>27.06</u>	<u>24.869</u>

7.	8.048	92.016	.9	.6	.84
	<u>3.019</u>	<u>54.007</u>	<u>.3</u>	<u>.2</u>	<u>.26</u>

8.	.07	.08	.95	.21	.836	.671
	<u>.05</u>	<u>.03</u>	<u>.87</u>	<u>.18</u>	<u>.369</u>	<u>.569</u>

9.	.052	.064	.007	.094	.067	.051
	<u>.018</u>	<u>.039</u>	<u>.001</u>	<u>.035</u>	<u>.018</u>	<u>.047</u>

~~X~~ 10.	.085	.011	.013	.417	.243	.647
	<u>.076</u>	<u>.004</u>	<u>.009</u>	<u>.335</u>	<u>.235</u>	<u>.549</u>

11. $.42 - .24$

14. $.15 - .06$

12. $7.04 - 4.16$

15. $8 - 3.167$

13. $.325 - .269$

16. $1 - .053$

KEEPING THE TOOLS SHARP

Multiply.

Check each answer.

$$\begin{array}{r} 1. \quad .3 \\ \underline{3} \end{array} \quad \begin{array}{r} .2 \\ \underline{4} \end{array} \quad \begin{array}{r} .8 \\ \underline{7} \end{array} \quad \begin{array}{r} .6 \\ \underline{9} \end{array} \quad \begin{array}{r} .36 \\ \underline{2} \end{array} \quad \begin{array}{r} .75 \\ \underline{5} \end{array} \quad \begin{array}{r} .276 \\ \underline{3} \end{array}$$

$$\begin{array}{r} 2. \quad .854 \\ \underline{28} \end{array} \quad \begin{array}{r} 2.8 \\ \underline{3} \end{array} \quad \begin{array}{r} 9.4 \\ \underline{7} \end{array} \quad \begin{array}{r} 1.56 \\ \underline{4} \end{array} \quad \begin{array}{r} 34.89 \\ \underline{6} \end{array} \quad \begin{array}{r} 4.273 \\ \underline{5} \end{array}$$

$$\begin{array}{r} 3. \quad 9 \\ \underline{.8} \end{array} \quad \begin{array}{r} 3 \\ \underline{.2} \end{array} \quad \begin{array}{r} 47 \\ \underline{.6} \end{array} \quad \begin{array}{r} 58 \\ \underline{.4} \end{array} \quad \begin{array}{r} 62 \\ \underline{.53} \end{array} \quad \begin{array}{r} .83 \\ \underline{.75} \end{array} \quad \begin{array}{r} .269 \\ \underline{.16} \end{array}$$

$$\begin{array}{r} 4. \quad .6 \\ \underline{.4} \end{array} \quad \begin{array}{r} .8 \\ \underline{.7} \end{array} \quad \begin{array}{r} .53 \\ \underline{.6} \end{array} \quad \begin{array}{r} .72 \\ \underline{.8} \end{array} \quad \begin{array}{r} .436 \\ \underline{.5} \end{array} \quad \begin{array}{r} .389 \\ \underline{.3} \end{array}$$

$$\begin{array}{r} 5. \quad .84 \\ \underline{.32} \end{array} \quad \begin{array}{r} .67 \\ \underline{.29} \end{array} \quad \begin{array}{r} .526 \\ \underline{.31} \end{array} \quad \begin{array}{r} .913 \\ \underline{.56} \end{array} \quad \begin{array}{r} 7.369 \\ \underline{25} \end{array} \quad \begin{array}{r} 23.475 \\ \underline{147} \end{array}$$

$$\begin{array}{r} 6. \quad 576 \\ \underline{.253} \end{array} \quad \begin{array}{r} 732 \\ \underline{.367} \end{array} \quad \begin{array}{r} 908 \\ \underline{.418} \end{array} \quad \begin{array}{r} 271 \\ \underline{6.7} \end{array} \quad \begin{array}{r} 148 \\ \underline{2.9} \end{array} \quad \begin{array}{r} 365 \\ \underline{3.14} \end{array}$$

$$\begin{array}{r} 7. \quad 4.67 \\ \underline{2.5} \end{array} \quad \begin{array}{r} 52.3 \\ \underline{6.4} \end{array} \quad \begin{array}{r} 13.18 \\ \underline{7.3} \end{array} \quad \begin{array}{r} 647 \\ \underline{5.73} \end{array} \quad \begin{array}{r} .384 \\ \underline{5.3} \end{array} \quad \begin{array}{r} 7.206 \\ \underline{3.8} \end{array}$$

$$\begin{array}{r} 8. \quad 5.649 \\ \underline{4.7} \end{array} \quad \begin{array}{r} .826 \\ \underline{6.27} \end{array} \quad \begin{array}{r} .4 \\ \underline{.2} \end{array} \quad \begin{array}{r} .3 \\ \underline{.3} \end{array} \quad \begin{array}{r} .1 \\ \underline{.1} \end{array} \quad \begin{array}{r} .02 \\ \underline{.2} \end{array}$$

$$\begin{array}{r} 9. \quad .03 \\ \underline{.2} \end{array} \quad \begin{array}{r} .02 \\ \underline{.4} \end{array} \quad \begin{array}{r} .04 \\ \underline{.2} \end{array} \quad \begin{array}{r} .03 \\ \underline{.3} \end{array} \quad \begin{array}{r} .12 \\ \underline{.7} \end{array} \quad \begin{array}{r} .14 \\ \underline{.6} \end{array}$$

$$\begin{array}{r} 10. \quad .15 \\ \underline{.5} \end{array} \quad \begin{array}{r} .29 \\ \underline{.4} \end{array} \quad \begin{array}{r} .16 \\ \underline{.3} \end{array} \quad \begin{array}{r} .12 \\ \underline{.6} \end{array} \quad \begin{array}{r} .29 \\ \underline{.3} \end{array} \quad \begin{array}{r} .18 \\ \underline{.4} \end{array}$$

$$\begin{array}{r} 11. \quad .04 \\ \underline{.03} \end{array} \quad \begin{array}{r} .05 \\ \underline{.07} \end{array} \quad \begin{array}{r} .02 \\ \underline{.04} \end{array} \quad \begin{array}{r} .025 \\ \underline{.3} \end{array} \quad \begin{array}{r} .002 \\ \underline{.4} \end{array} \quad \begin{array}{r} .003 \\ \underline{.2} \end{array}$$

KEEPING THE TOOLS SHARP

Divide. Check each answer.

1. $4\overline{)8}$

$7\overline{)91}$

$3\overline{)735}$

$5\overline{)22.5}$

2. $6\overline{)5.4}$

$8\overline{)4.08}$

$37\overline{)918.71}$

$74\overline{)232.508}$

3. $4.3\overline{)26.66}$

$6.5\overline{)97.5}$

$1.38\overline{)59.34}$

$5.32\overline{)35.644}$

4. $.9\overline{)3.78}$

$.45\overline{).1125}$

$.804\overline{).7236}$

$.36\overline{).72}$

5. $.64\overline{)51.2}$

$1.32\overline{)6.6}$

$.004\overline{)2.4}$

$.06\overline{)4.2}$

6. $.3\overline{)9}$

$.8\overline{)48}$

$.37\overline{)74}$

$.15\overline{)60}$

7. $.04\overline{)28}$

$.07\overline{)35}$

$.03\overline{)6}$

$.06\overline{)3}$

8. $3.5\overline{)14}$

$8.6\overline{)43}$

$4.25\overline{)34}$

$.675\overline{)27}$

9. $6\overline{).36}$

$5\overline{).375}$

$3.4\overline{).272}$

$4\overline{).012}$

10. $7\overline{).063}$

$.08\overline{).0064}$

$25\overline{).75}$

$45\overline{).27}$

Round the quotients to the nearest tenth:

11. $5\overline{).72}$

$26\overline{)4.57}$

$8.3\overline{)27.64}$

$3.2\overline{)14.8}$

Round the quotients to the nearest hundredth:

12. $4\overline{).935}$

$.7\overline{)2.063}$

$6.5\overline{)43.24}$

$2.8\overline{)19}$

Divide. Express the remainders as decimals to the nearest hundredth:

13. $3\overline{)14}$

$8\overline{)27}$

$32\overline{)49}$

$64\overline{)219}$

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TABLES OF MEASURES

MEASURES OF LENGTH

LIQUID MEASURES

12 inches (in.) = 1 foot (ft.)	*2½ standard measuring cups
3 feet (ft.) = 1 yard (yd.)	= 1 imperial pint (pt.)
36 inches (in.) = 1 yard (yd.)	(2 standard measuring cups
16½ feet (ft.) = 1 rod (rd.)	= 1 U.S. pint)
5½ yards (yd.) = 1 rod (rd.)	2 pints (pt.) = 1 quart (qt.)
320 rods (rd.) = 1 mile (mi.)	4 quarts (qt.) = 1 gallon (gal.)
5280 feet (ft.) = 1 mile (mi.)	MEASURES OF WEIGHT
1760 yards (yd.) = 1 mile (mi.)	16 ounces (oz.) = 1 pound (lb.)
	2000 pounds (lb.) = 1 Ton (T.)

DRY MEASURES

2 pints (pt.) = 1 quart (qt.)	12 things = 1 dozen (doz.)
8 quarts (qt.) = 1 peck (pk.)	12 dozen = 1 gross (gro.)
4 pecks (pk.) = 1 bushel (bu.)	144 things = 1 gross (gro.)

COUNTING

MEASURES OF TIME

60 seconds (sec.) = 1 minute (min.)
60 minutes (min.) = 1 hour (hr.)
24 hours (hrs.) = 1 day (da.)
7 days (da.) = 1 week (wk.)
52 weeks (wk.) = 1 year (yr.)
365 days (da.) = 1 year (yr.)
366 days (da.) = 1 leap year
10 years (yr.) = 1 decade
100 years (yr.) = 1 century

MEASURES OF AREA

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet (sq. ft.) = 1 square yard (sq. yd.)
30¼ square yards (sq. yd.) = 1 square rod (sq. rd.)
160 square rods (sq. rd.) = 1 acre (A.)
640 acres (A.) = 1 square mile (sq. mi.)
640 acres (A.) = 1 section

MEASURES OF VOLUME

1728 cubic inches (cu. in.) = 1 cubic foot (cu. ft.)
72 cubic feet (cu. ft.) = 1 cubic yard (cu. yd.)

*As now defined by Standards Division, Department of Trade and Commerce, Ottawa, by authority of Order in Council, P.C. 1957-340 of March 14, 1957.

178 280 281
16 196

